Oct.

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Science and Invention

THE TRUTH ABOUT ASTROLOGY

See Page 494

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Single Dial Radio

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October, 1926
No. 6

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Liquid Air Used to Reclaim Vast Territory

The wonderful story of how the chemist has entered the field of civil engineering.

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"Those Who Refuse to Go Beyond Fact Rarely Get As Far As Fact" - - - HUXLEY

THE ASTROLOGY HUMBUG

By HUGO GERNSBACK

ONE would think that in an enlightened age, such as we are pleased to call our present era, Astrological nonsense should have disappeared from the face of the earth long ago. The reverse is actually the fact, and Astrology is gaining supporters in a rather large strata of the public all over the world, who are preyed upon by these modern soothsayers and fakers in general.

Astrology originally was the science from which our present Astronomy sprang, but Astrology itself has long been discredited by science, as well as the better-educated classes. Astrology is a pseudo-science that feeds upon superstition and encourages it. Summed up in a few words, it may be said that Astrology is a superstition according to which the stars are believed to affect the destiny of human beings.

Just how the stars are supposed to affect humanity, no astrologer has ever ventured to say. The *modus operandi* of the so-called "horoscope" is usually that the more or less exact date of birth is connected in some way with the planets and constellations in general, but just what this connection is, no one has ever ventured to state, except vaguely.

For instance, take the planet Venus, a body roughly as large as the earth. We are asked to believe that this planet will exert an effect upon a person at birth. Why exactly at birth? Why not before birth, and why not after birth? The astrologers remain silent on this.

It is ludicrous for any intelligent person to believe that a heavenly body, a great distance removed, can have any effect whatsoever, whether gravitational, electro-magnetic, or psychic, on us little human beings, and there has never been a good reason advanced why this should be so. If a being of flesh and bone is affected, why not a horse—why not a gorilla—why not a whale? They should all be affected in the same manner.

Furthermore, if the astrologers are right, then every human being born at the same instant all over the earth should have exactly the same horoscope and the destiny of each should be exactly alike. This alone should convince any reasoning human being that everything contained in Astrology is Simon pure piffle, because every one knows that twins born at the same time, and people born at the same instant have *entirely different* careers and destinies. Some turn out to be eminently successful. Others become criminals, etc.

Then, too, astrologers, since olden times, have been careful to veil their language in such a manner that different "deductions" and interpretations can be made. The phrase, "You will make a journey," may be taken to mean a street car ride of six blocks, or it may refer to a trip to the other end of the world. We find the same thing all the way through the so-called "horoscopes"—always vague, always indefinite. If Astrology were an exact science, it would be possible to give exact data, which, of course, is never forthcoming, and moreover never will.

In the meanwhile, a large horde of astrologers and near-astrologers prey upon credulous souls whose intelligence rating, as a rule, is not very high, or who, otherwise, are so superstitious that their reasoning is thereby deadened. And let no one think that astrologers are not well paid. The price of horoscopes in this country varies anywhere from $5 to $300, depending upon how much these fakers can extort from their victims.

If Astrology were a harmless sport, no one would find fault, but the trouble is that astrologers actually confuse these simple mortals by preying upon their fears, and are often actually successful in doing great damage to their clients. For instance, a client will be told that between October 1st and 8th the stars will be "against" him and he must not engage in any business contracts. What happens? The man, actually believing such nonsense, is afraid to go ahead with certain ventures that he might otherwise have undertaken, and in more than one case he has been the loser on this account. Auto-suggestion induced in these victims also does great michief, and for the time being retards whatever progress they may be making in their life work.

The trouble so far has been that astrologers cannot be apprehended by law, for the reason that they are careful not to be classed with fortune tellers, whose activities are illegal in many states. They usually escape conviction for fraud, because they do not tell your fortune, but merely give you a "reading" from the supposed influence of the heavenly bodies.

And what about the predictions that never come true? We never hear anything about these, although they are naturally in the vast majority. To be certain, as in all things, an astrologer once in a while will strike a bull's eye. If you make enough guesses, you are apt to be right once in a while, too. This is the nature of things. Of course, if it happens, the astrologer is at once acclaimed as a great personage, and through the course of years he will accumulate enough evidence to show a quantity of "verified forecasts." Any shrewd astrologer who knows how to put his language can twist a forecast around to make it appear that the prediction was correct, but that can be done with practically anything else. You can stand on a street corner and make a pretty safe forecast of how many automobiles will pass a given corner during the next hour. If you have had a little experience, you will come pretty close to the facts. This is the law of averages.

By the same law, you can also forecast how many of a certain group of people will reach a certain age, and again you will be able to come close to the figure. The life insurance companies and many other institutions work on exactly such a plan, but none of these would be willing to make an *exact* forecast for any one individual.

On the other hand, most people never seem to consider the fact that even if there were such a thing as a "verified forecast," this would nullify itself for the following reasoning: Suppose it were forecast that you would die in a railroad wreck on a certain date. Naturally, knowing about the forecast, *you would not go near a railroad that day,* if you knew that the forecast was scientifically accurate. *Consequently you would not be killed in a railroad wreck that day.* Therefore, it must be plain that the forecast cannot be correct because the event does not take place as forecast, and if it does not occur, it can not hold true, scientifically or otherwise. The same logic must be applied to all astrological forecasts of this kind. If you know in advance what is going to happen, you can take measures to prevent its occurrence, and if it does not happen, the forecast is obviously wrong.

And if you still have doubts about astrologers, just give them the names of a few deceased persons, and you will receive the most remarkable horoscopes on nearly every one of them, and even the best ones will give you a good deal of amusement.

Also, please do not deceive yourself by joining that class of those simple mortals who tell you glibly that they had their horoscopes taken, "just for fun, of course," all the while insisting that they know it is a humbug. *Secretly* they think "there may be something to it after all." They may deceive you, but not themselves.

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Mr. Hugo Gernsback speaks every Monday at 9 P. M. from Station WRNY on various scientific and radio subjects.

Modeling by Photography

By LUCIEN FOURNIER

Fig. 2. The photo above shows the effect of stacking a number of the zinc leaves produced in this process so that they indicate the features in relief, as in sculpture.

THE possession of an artistic photograph of a relative or a friend is always a source of pleasure. It is placed in a carefully chosen frame, put in a prominent position, and regarded with much satisfaction—but it is never more than a photograph. How much more pleasant and flattering it would be to receive a beautiful portrait of bronze or silver—even of gold—of a person who is dear to you. Until now, only very wealthy people have been able to indulge their fancy by having a medal engraved in their image; everyone else has been limited to a common photograph. Celebreties are presented with medallions in commemoration of their activities, but not everyone has achieved the honor of being immortalized in bronze by a famous artist at the expense of the State.

Now everything is changed. A French inventor, M. Givaudan, has just constructed an apparatus which makes possible the casting of as many medals as may be required from a series of photographic prints taken with the aid of a motion picture camera. Although the apparatus required is rather expensive, it is nevertheless a probable source of a good income to the operator. In place of going to the photographer's studio, as in the past, you will go to the "photo-sculptor's" place of business, and you will be able to order a dozen medals of any size desired and of as precious a material as the purse will allow.

For the benefit of those of our readers who would like to know how the thing is done, we are going to say a few words about the apparatus.

Look first at Fig. 2. This represents a gentleman who might very well figure in a museum of ethnography—he seems very thoroughly tatooed. This tatooing, however, is a result of a particular method of photography.

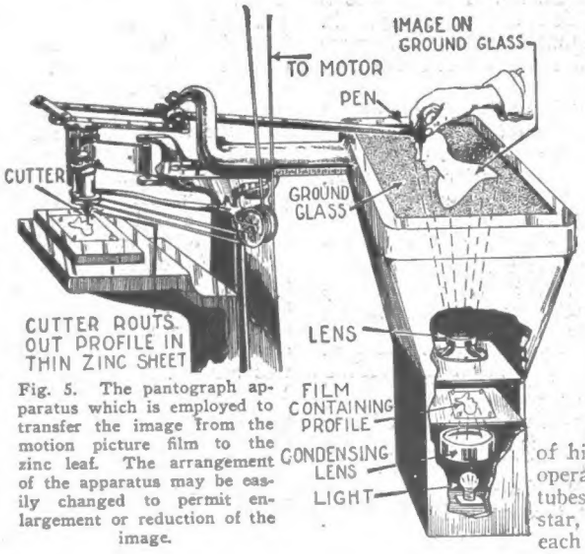


Fig. 5. The pantograph apparatus which is employed to transfer the image from the motion picture film to the zinc leaf. The arrangement of the apparatus may be easily changed to permit enlargement or reduction of the image.

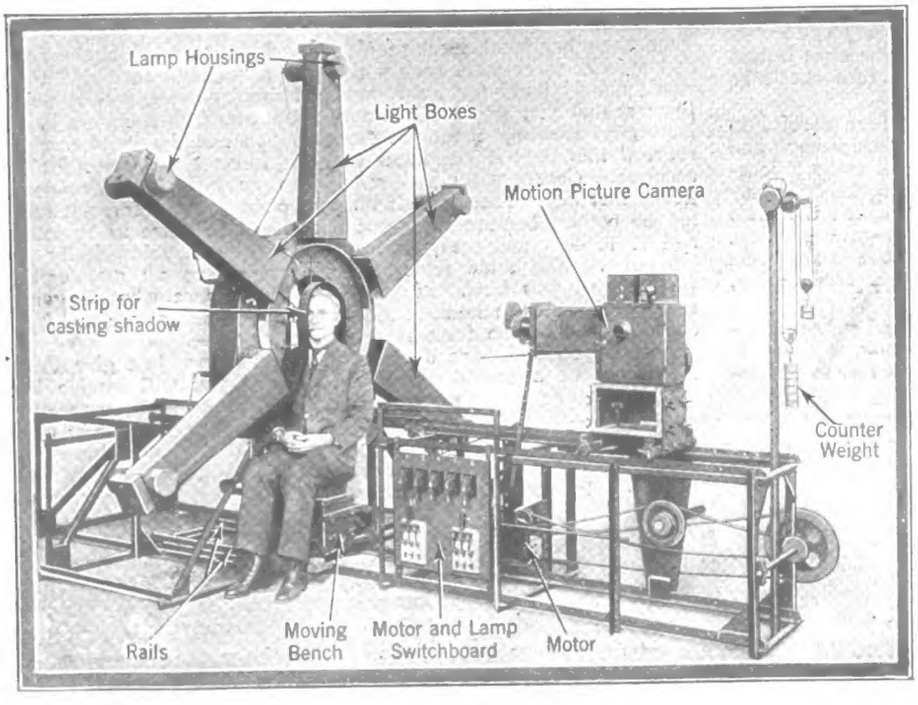


Fig. 4. The accuracy with which the apparatus performs its function may be seen upon inspection of this portrait bas-relief. The portrait may be produced in any of the usual metals, or a cast in plaster may be made.

Imagine that the head has been cut up into slices, that each slice has been photographed separately, the skillfully cut-out profiles have been placed one upon the other; we have then an exact reproduction in relief of the subject.

The procedure which we have just indicated is hardly practical or advisable in making a medal; but if we may not cut the head into slices, we may easily photograph it by successive "slices" if we possess the necessary apparatus. It is this apparatus which M. Givaudan has invented, and which is seen in Fig. 1. You will probably say that it is an instrument of torture resurrected from the most barbarous epoch in the history of humanity, but the "patient" doesn't appear to suffer—he is simply posing before the lens of a motion picture camera. He is seated upon a bench which rolls on two rails and which moves him in spite of himself as the camera operates. The five large tubes, in the form of a star, which surround him each contain a powerful electric light at their outer extremity. The light from these lamps brightly illuminates the head of the subject; but we have said that it is necessary to photograph the profile by successive slices or layers. Nothing could be more simple. You see that the head is surrounded by an iron strip; this strip serves to cast a shadow on the head in such a manner that we may obtain a ser-

(*Continued on page* 561)

Fig. 1. At the left is seen the motion picture camera used in this process, with its accessory apparatus. The entire machine is controlled from the center switchboard.

Fig. 3. At the right are several of the photographs taken by the motion picture camera at different stages of the process. This shows the appearance of the motion picture film before the image is transferred to zinc.

Houdini Outdoes Fakirs

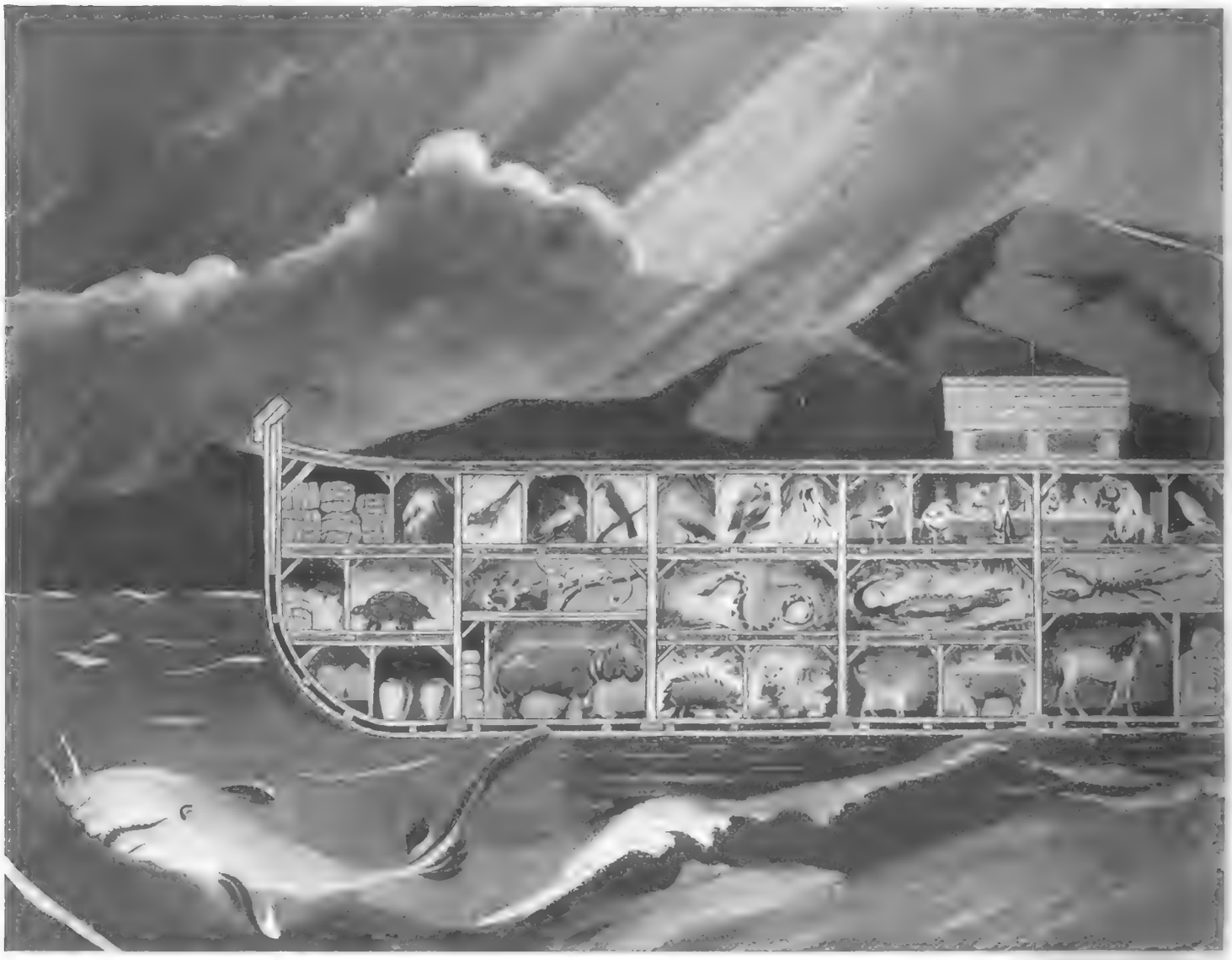
Houdini—The World's Most Famous Handcuff King, Proves That There Is No Trickery in Remaining in a Sealed Coffin for One and a Half Hours. Claims Cataleptic State Unnecessary.

FOR quite a few months a Hindu fakir, Rahman Bey, has been demonstrating his powers of producing uncanny effects. He would entered a cataleptic state, would have himself buried in a coffin for from ten minutes to half an hour or thereabouts, and then would receive the attention of scientific men who would write up the "phenomenal feats." Harry Houdini, known throughout the world, demonstrated to a body of scientists and physicians that he could duplicate, and in fact do even more than the Hindu fakir without entering the cataleptic state, and thus proved that no man is superhuman. Houdini remained in a sealed coffin for one hour, thirty-one minutes and thirty seconds, surpassing the stunt of the Hindu mystic.

THE photo above shows Harry Houdini stepping out of the casket at the close of the experiment. The one at the left shows the size and arrangement in the casket, and the one below is a picture taken in the Hotel Shelton pool with the casket submerged.

Scientifically this experiment is of great value. It demonstrates that miners could remain underground in a closed area or that men could survive in a submarine much longer than was at first supposed, if they will keep their wits about them. During one hour approximately twenty-nine cubic feet of air is breathed. Approximately one and a half cubic feet of oxygen is absorbed, and one and a quarter cubic feet of carbon dioxide is excreted. Pulse on opening casket was too high to count and about 90 seconds later dropped to 142. No objectionable stuffy odor was noticeable. When the covers of the coffin were removed, the air rushed in violently, showing that the carbon dioxide did not replace the oxygen absorbed. In sand pit burials there is a sufficient amount of air penetrating between the grains of sand to permit of life over many hours.

DR. HEREWOOD CARRINGTON wrote about Rahman Bey in the following terms in a newspaper article. "All medical authorities agree that it is impossible for a human being to live more than three to five minutes in a sealed coffin." Yet Houdini entered a sealed coffin at the Hotel Shelton pool and he remained therein for one hour, thirty-one minutes and thirty seconds, thus proving to Dr. Carrington that he is not an authority on medical subjects. Houdini disclaimed the exercise of any super-natural power and stated that every normal human being could get in the same coffin and stay there as long as he did, if the individual took care to breathe lightly and did not exert himself. Two editors of SCIENCE AND INVENTION Magazine carefully examined the casket before Houdini entered the same, and can attest to the fact that there was absolutely no deception practiced. No oxygen in any sealed containers entered the coffin. No air could get in. Houdini stripped, donned a bathing suit, and entered the casket, after which the cover was soldered in place. The caps were screwed on and then the entire casket was sunk into the pool. Weights were applied and men stood on the cover to prevent the casket from floating. Communication was had with Houdini by means of a telephone and a signal bell. The editors placed a thermometer in the casket. It read 99.2 at maximum.

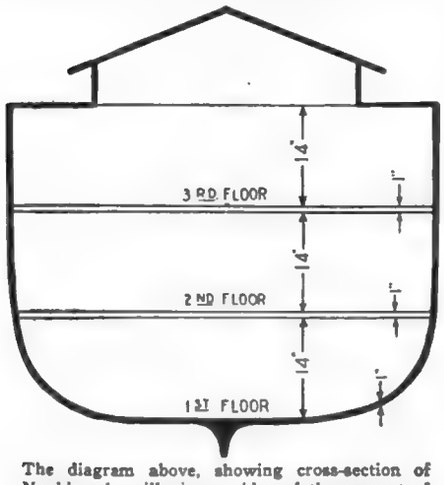


Was Noah's Ark Possible?

" . . . . In the six hundredth year of Noah's life, in the second month, the seventeenth day of the month, the same day were all the fountains of the great deep broken up, and the windows of heaven were opened.

"And the rain was upon the earth forty days and forty nights.

"In the self same day entered Noah, and Shem, and Ham, and Japheth, the sons of Noah, and Noah's wife and the three wives of his sons with them, into the ark;



The diagram above, showing cross-section of Noah's ark, will give an idea of the amount of headroom and floor space available.

"They, and every beast after his kind, and all the cattle after their kind, and every creeping thing that creepeth upon the earth after his kind, and every fowl after his kind, every bird of every sort.

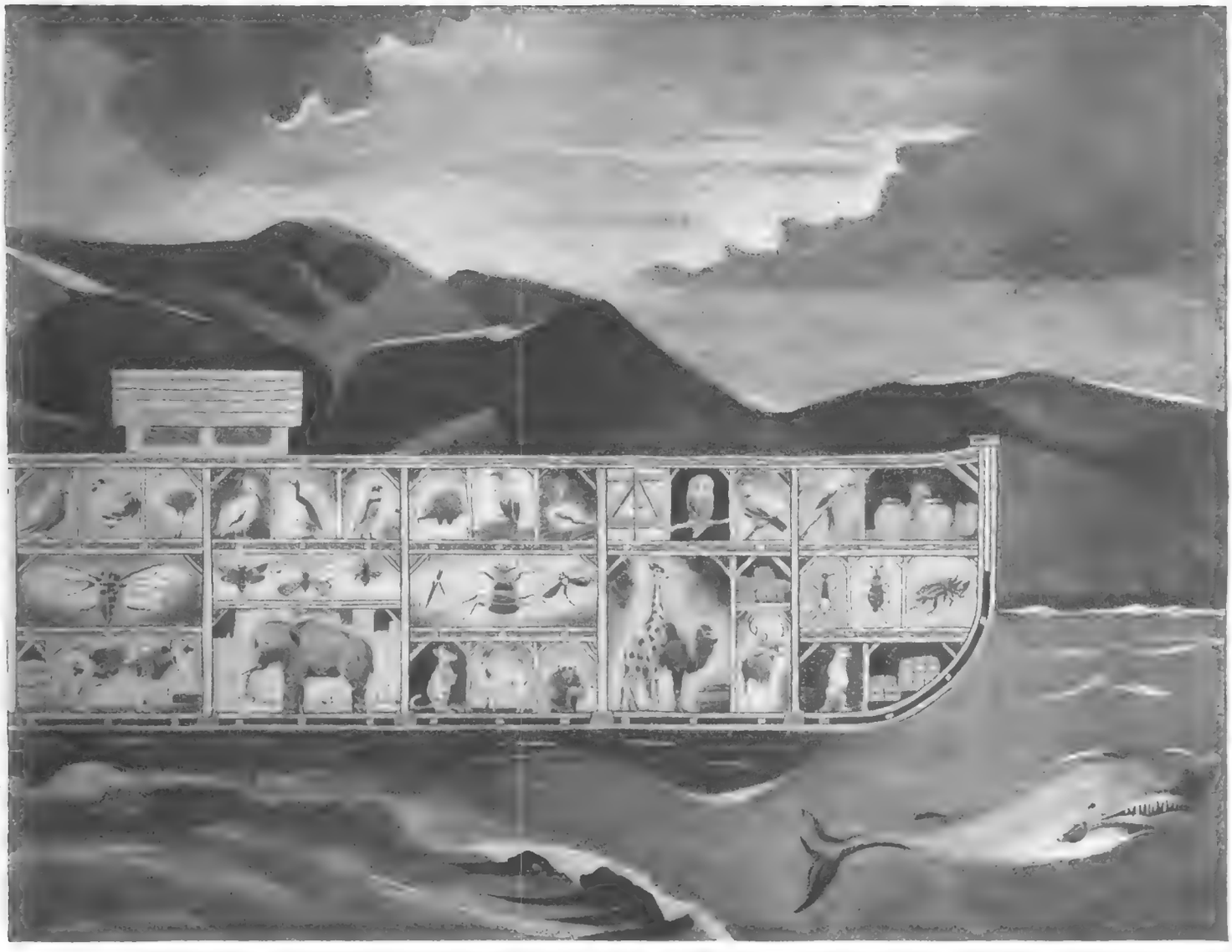
"And they went in unto Noah into the ark, two and two of all flesh, wherein is the breath of life."—(Genesis 7:11.)

THIS immortal quotation has always given rise to more or less of puzzlement in the minds of modern students of the Old Testament. How, you ask yourself, could Noah get all the animals, all the birds, all the insects into the ark and then store away enough food for this multitude and for the eight human passengers to last them three hundred and forty-six days? Yet it is all not quite so fantastic as it seems.

We are indebted to a keen student of Bible lore, Rev. J. Fleming Atkins of Ramsey, N. J., for a quantity of interesting information which he has compiled from Biblical records with the intention of showing that the Biblical account of the ark and its contents is quite plausible.

The actual dimensions of the ark are mathematically stated in Genesis 6, 15 and 16, where they are given as: length, 300 cubits; width, 50 cubits; depth, 30 cubits. Translated into modern terms, we have length, 450 feet; width, 75 feet; depth, 45 feet. Three stories or decks are specified, each story being—after allowing one foot for the flooring—14 feet high. Multiplying 450 by 75 gives us 33,750 square feet of surface per story, total 101,250 square feet of floor for the entire ark. This is slightly

The average size of animals is about that of a common house cat. For each of the animals in the ark we have reserved ten sq. ft. of floor space and fourteen feet of headroom. Inspection of the drawing at the right will make it plain that more than sufficient room is provided.



Our artist's impression of the way Noah probably placed the animals may not suit your ideas on proper housing, but a glance at the drawing above will help you to visualize one of the possible methods which might have been employed by the builders to provide space.

more than two acres. According to the best modern tonnage space rating, which allows about 1,000 pounds per square foot of deck space, a conservative estimate of the tonnage of the ark would be 32,000 tons, with possible extreme rating of 42,400 tons. The R.M.S. "Mauretania," rated at 30,969 tons, offers a modern comparison.

Dr. Alfred Russel Wallace, in his "Geographical Distribution of Animals," tells us that there are about 1,700 species of animals, 10,087 species of birds, 987 of reptiles, and approximately 100,000 of insects. The Bible tells us that at least two specimens of each species were included in the roster; in some cases seven pairs were listed. Now, the question is, how did Noah house all these creatures in the ark?

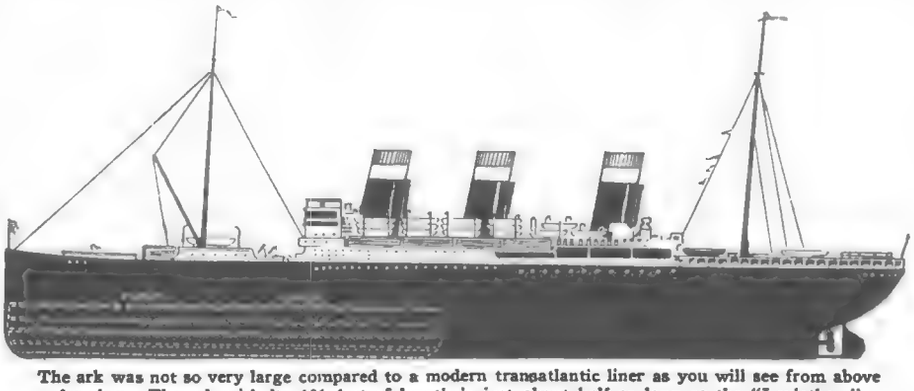
The steamers that carry livestock out of New York City allow about 20 square feet for each cow. We must consider, however, that the animals of the earth vary much in size. Dr. Wallace gives the average size as that of the common house cat, so we will take this as the average for the animal species. There are 33,750 square feet to each floor, so we will put the animals on the first floor; 3,400 animals would have nearly 10 square feet each, and considering the average size we have agreed upon, that would be quite a palatial cabin. Of course we must allow for a great deal of food storage, but remember that we are considering only one layer of animals and the rest of the 14 feet of head room may be used to store the food.

The second floor we will allot to the insects and reptiles, for themselves and their food supply. In this space of 33,750 square feet we must place 200,000 insects and 1,974 reptiles. The insects of course average very small indeed, and the reptiles only slightly larger. Computation shows us that we have about one-sixth of a square foot for each, that is, about 24 square inches. That should certainly be plenty of space.

We have remaining the entire upper or third floor for Noah and his family of seven, with 20,174 birds to sing for them. The birds would average very small, since the smaller species predominate, but we can allow about 1½ square feet of floor space for each to call his own, so the larger birds should be able to find plenty of room.

It seems incredible, even after reading these figures, that a pair of each of the world's creatures could be housed in a vessel considerably smaller than the average trans-Atlantic steamer. We have, however, the evidence of the measurements given in the book of Genesis and the testimony of mathematics to assure us that the ark may be more than a legend.

". . . . And in the second month, on the seven and twentieth day of the month, was the earth dried. And God spake unto Noah, saying, "Go forth of the ark . . . ."



The ark was not so very large compared to a modern transatlantic liner as you will see from above drawing. The ark with its 450 feet of length is just about half as long as the "Leviathan."

How Byrd Found North Pole

By WILLIAM P. SULLIVAN
AERONAUTICAL ENGINEER

The method employed by Commander Byrd and Floyd Bennett in locating their positions while navigating their aerial course from Spitzbergen to North Pole and return.

A SUBJECT of great interest and yet very much of a mystery to most people is the method employed by Commander Byrd and Floyd Bennett in locating their positions while navigating their course by air from Spitzbergen to the North Pole and return.

To describe in a few simple words the many methods and instruments used in navigation would be difficult and since navigation for aircraft up to the present time has been in an undeveloped state as compared to the navigation of the sea and land, though similar in theory, a brief description of aircraft instruments and methods will be of interest.

Aerial navigation is a science by means of which aircraft are guided from one point to another above the earth's surface. In practice the pilot or navigator makes use of a number of different methods which enable him to follow his course and to determine his geographical position from time to time during the progress of the journey. In aerial navigation readings must be made more often and more quickly calculated than on sea or land because of the increased speed of the airplane. The rapid change in position of the airplane also makes readings with instruments difficult and inaccurate, making a number of rapid readings necessary, sometimes as many as six and the average taken, in order that readings having too great an error can be easily detected and omitted.

Ordinary navigation of the air at present consists of simple piloting. The pilot following a course and determining his positions by reference to distinctive landmarks, usually identified by reference to maps or charts. In a great many cases a course is followed simply by "dead reckoning." This consists of deducing the position from the direction and rate of travel. This method of course is inaccurate due to the inaccuracies of the instruments which determine speed or indicate direction. Under ordinary conditions on very short flights this method is suitable, but on longer flights entirely unreliable. This is especially so when high altitude is essential on the course, because of the unknown speed and direction of the air currents with reference to the ground. In any case the only reliable method of checking positions accurately is by astronomical observations, special compasses or radio bearings.

For purposes of air navigation the astronomical method offers the best advantages and has been reduced to a science through years of study in marine navigation. The method may be used by day or by night whenever the heavens are visible. It's practical application is simple and results can be obtained in a very few minutes. However, certain limits restrict its use, such as clouds at high altitudes, but the most serious restriction lies in the fact that in general only the sun can be seen in the day time and a complete determination cannot be made without the use of instruments other than the sextant. Most of the instruments used are similar to those used in marine navigation, changes being made to suit conditions met with while flying. Astronomical observations are now made with an improved type of bubble sextant designed for rapid readings, special compasses measuring the strength and direction of the earth's magnetic field while radio bearings are determined by the strength and direction of radio waves from stations on the ground. However, the theory of determining position by astronomical observations must first be understood.

The earth's surface and the heavens may be considered as two concentric spherical surfaces rotating with respect to each other, the heavens being at an infinite distance from the center. The relative position of the earth and heavens is determined by the time of day and day of the year. The axis of rotation, passing through the earth's poles, meets the celestial sphere at the celestial poles; and the plane of the earth's equator intersects the celestial sphere in the celestial equator. Planes passing through the poles intersect the sphere in great circles, which are called meridians. Similarly planes parallel to the equatorial plane determine small circles, known as parallels.

PROBABLY there have been more questions asked as to how Commander Byrd and Floyd Bennett navigated their aerial route to the North Pole and return, than all others. In the accompanying article Mr. Sullivan has endeavored to make as clear as possible the astronomical method utilized by these two intrepid flyers in their remarkable flight to the North Pole and return. Mr. Sullivan is a well-known aeronautical engineer and has had a great deal of flying and design experience both in connection with dirigibles and airplanes. The author interviewed Commander Byrd as to the data here presented. Our readers will remember the author for many of the excellent and authoritative articles which have appeared in past numbers.

The location of any point on the earth's surface is specified by the coordinates of latitude and longitude. Latitude is the angular distance north or south of the equator measured on a meridian from zero at the Equator to 90° at the poles. North latitudes are reckoned as positive and south latitudes negative. Longitude is the angular distance along the Equator east or west of an arbitrary meridian measured in angular units or units of time from zero to 180° or zero to 12 hours, and positive or negative according to whether it is west or east. The arbitrary meridian commonly used is that of Greenwich near London. Longitudes may also be measured by the angles at the poles between the meridians, the zero meridian being that of Greenwich.

Several systems of coordinates are used in locating stars on the celestial sphere. In one system declination and right ascension are used, declinations on the celestial sphere being measured exactly as latitudes are measured on the earth. Right ascension corresponds to longitude but is measured eastward from an arbitrary zero, the first point of Aries, through the full circles of 360° or 24 hours. If the prime meridian be taken as passing through the observer's zenith, right ascension is replaced by hour angle and a second system is obtained in which the coordinates are declination and hour angle. Other systems are also employed but are not important for the purposes of navigation.

A straight line from any star to the center of the earth will meet the earth's surface in a point called the geographical position of the star. If the star's declination and right ascension at the time are known, this point can be located in terms of latitude and longitude. The problems of the navigator consists of finding his geographical coordinates by locating himself with reference to the geographical position of one or more stars.

In the drawing on the opposite page, which is a representation of a portion of the earth's surface, P is the pole, Z is the position of the observer, and S is the geographical position of the star. These points form the vertices of a spherical triangle ZPS which is known as the "astronomical triangle." The angle at P is the hour angle, and the angle at Z is the azimuth of the star. The angle at S is called the parallactic or position angle. The navigator in solving this astronomical triangle is able to find his position in latitude and longitude.

The altitude of a star is its angular elevation measured from the observer's horizon towards its zenith. Therefore in order to find the altitude of a star the navigator requires some means for indicating his horizon. A reference line is furnished by a natural or artificial horizon.

The level surface of the sea affords the most convenient and accurate natural reference plane, if it is clearly visible. The surface of the land, if not too rugged, provides an even more convenient horizon as it is more sharply defined. But this natural horizon is not always available, because first of all it is of poor visibility at night; and in most cases while flying at high altitudes, it is obscured from view due to haze and cloud formations and as the aviator ascends it gradually disappears. With a further increase in altitude a horizon often reappears formed by an upper layer of fog or haze. These natural horizons are formed by atmospheric conditions and with the exception of the surface of the sea are inaccurate, as the observer has no means of determining whether or not they are truly horizontal. Therefore the sextant is provided with an *artifical* horizon.

The bubble level is the simplest form of artificial horizon and most convenient as far as sextants are concerned, but care must be taken to reduce acceleration errors, and it can only be used accurately while flying at uniform speed on a straight course while the reading is checked.

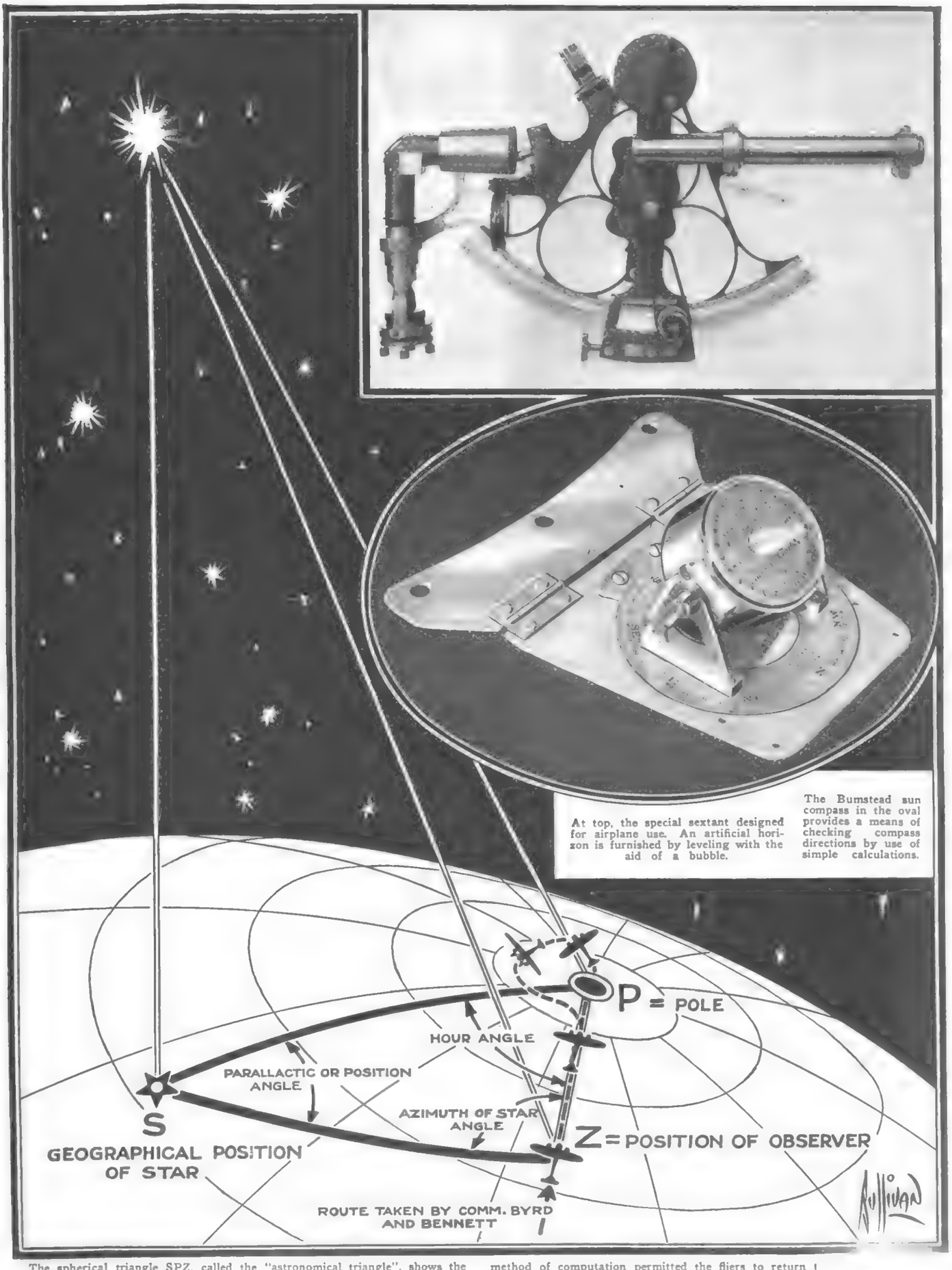
Aircraft sextants while not in general use, because of the scarcity of long distance flights, are being developed for future air travel, both for commercial use and in time of war. The theory, construction and operation are similar to those of the marine sextant, except for lightness and speed in operation. The angular field of view included in the index glass is made as large as possible, and the telescope is of low power and has a large field of view and is made to quickly change so as to observe with the naked eye. The arc is very clearly graduated with heavy lines and large figures.

The Byrd bubble sextant shown was designed and used by Commander Byrd in his North Pole flights and is an example of this type of instrument.

The next instruments of importance are the compasses. There are three types of these instruments, namely, the magnetic compass, the earth inductor compass and the gyroscopic compass. The gyroscopic compass has not yet been perfected for aircraft use.

(*Continued on page* 557)

Method and Instruments Used on Polar Flight



At top, the special sextant designed for airplane use. An artificial horizon is furnished by leveling with the aid of a bubble.

The Bumstead sun compass in the oval provides a means of checking compass directions by use of simple calculations.

The spherical triangle SPZ, called the "astronomical triangle", shows the measurements used by Byrd to find the direction of flight. The use of this method of computation permitted the fliers to return t parture without the aid of any visible landmark

The Truth About $6,000.00 For Proofs of

By JOSEPH H.

Above—the Holland Twins reproduced from a photograph in the October, 1923, SCIENCE AND INVENTION Magazine, alike even to their finger tips. One was a criminal and the other a business man. To the left, Josefa Blazek, left and her Siamese twin, Rosa Dvorack, born at the same instant. The former was married and has a twelve year old son. The latter is a spinster. What happened to the stars in this case? Why were they not both married?

ASTROLOGY — that pseudo-science which caters to the credulous and the ignorant is being expounded to a greater extent every year by quacks and would-be astrologers. We do not mean to infer that all astrologers are quacks; some of them actually entertain the false belief that there is some truth in astrology and that it is not a pseudo-science as classed by Webster. Although Webster did not lay any claim to infallibility, his definition of astrology is not only held but supported by every modern scientist.

To say that the Editors of SCIENCE AND INVENTION Magazine have investigated astrology would be putting it mildly. But before entering further upon this subject, let us understand exactly what the term astrology means.

Although originally this term was applied to the science of the stars and was synonymous with our modern inference of the word astronomy, it is now restricted to that system of predicting future events and particularly the fortunes of men through the position of the heavenly bodies. Generally the date of birth of the individual whose horoscope is to be drawn up is the all-important consideration. The circle of the heavens is divided into twelve equal parts, six above the horizon and six below, which are called the twelve "houses." Through these houses the planets move regularly and the planets according to astrologers control each one of the houses. By the relative positions of the planets at the time of birth the horoscope is drawn up. Further, the question as to whether the planets are in conjunction or opposition is also the basis of the astrologer's calculation.

What, then, is this mysterious influence which the astrologer claims affects the lives of every person born not only in these United States but also in the entire world? The astrologers do not claim that there is any definite known power; that would be an absurd claim. If the force were gravity then the pull of Mars on this earth expressed in square inches would be nearly infinitesimal. If it is not gravity why is so much stress laid on conjunctions and oppositions of planets?

Mars — our most popular planet—exerts a gravitational pull of .000000000105 lbs. per square inch on the surface of this earth, while the gravitational pull of the Woolworth Building at a distance of one-third of a mile or about one and one-half city blocks is .00000317 lbs. per square inch. It is seen, therefore, that the gravitational pull of one of our planets is only a three-millionth portion of the pull exerted by the Woolworth Building. It is also evident that the attraction of a row of buildings would be tremendously more powerful than that of all of the planets in conjunction or in a direct line extending from this earth.

Is this mysterious force light? No—for all of the planets are cold bodies. The term "cold" is used comparatively. The planets themselves do not give forth light of their own accord but merely reflect the light of the sun. Direct sunlight is billions and billions of times more powerful than the rays reflected by the planets. As a matter of fact, were the sun to be extingushed, life on this planet could not continue to exist but the light from the planets could be dispensed with. What other influence could there be? Let us assume that it is a psychic influence. Why then the necessity of conjunctions and opposition? The psychic influence should be present regardless of the position assumed by the planets, but a psychic influence is not a scientific influence. A man who does not believe in astrology could, under the circumstances, remain immune to any position assumed by any and all of the planets—and most men are.

We will let the astrologers answer the question "What is this mysterious influence?" Perhaps they can also account for the fact that twins born practically at the same moment may be widely different. A notable instance of this last assertion is the case of Abner and Albert Holland, two twins who were so much alike that none of their finger prints, with the exception of the small finger on the hand of each were different, yet one of these twins was a criminal and the other a successful business man. (see Oct. 1923 issue S. & I.) Perhaps the astrologers will tell us that one was born a few seconds after the other and consequently different "stars" ruled their lives. Then maybe they can explain the case of the Dvorack twins born joined back to back. Unquestionably their births must have been simultaneous, yet one of them is married and has a grown son and the other never married. Or maybe they could give us an explanation of the Siamese twins who were joined side to side at birth and were evidently born at the same second. One of the twins died more than an hour preceding the death of the other, and had there been a means of separating them the second one might have lived for a much longer time. Why did they not die at the same instant if the stars controlled their lives? Why did

$6,000.00
For Proofs of Astrology

SCIENCE AND INVENTION Magazine holds that there is nothing scientific in Astrology, that Astrology is not a science and that statements made by astrologers unless very general cannot be entertained seriously.

Accordingly, this publication has decided to award an Astrology Prize of $6,000 for the following:

$5,000 will be paid to the astrologer or forecaster who will foretell three major events of such a nature that he will have no control over the outcome of the same. He must describe in advance each event in detail, giving the location and result or the casualties if the event is an accident.

$1,000 will be paid to the astrologer or forecaster who will produce three accurate, detailed and perfect horoscopes, free of contradictions on the lives of three people whose initials will be given him when he requests the same and the birth dates will also be supplied by this office.

This contest closes October 1st, 1927, and all entries must reach us by that time. In event of a tie, prizes of an identical nature will be given those so tying.

Address all entries to Editor, Astrology, care of SCIENCE AND INVENTION Magazine, 53 Park Place, New York, N. Y.

ASTROLOGY

KRAUS

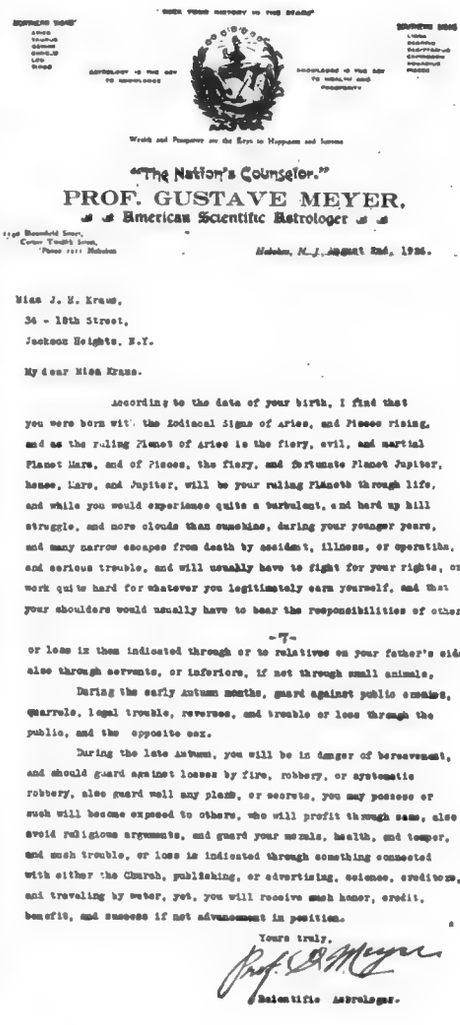
not both of the Dvorack twins marry at the same time if the planets controlled them?

The instant that an astrologer makes the assertion that there may have been other extenuating circumstances he is stepping away from astrology. Practically everything we do in life is due to extenuating circumstances.

Approximately four years ago the writer sent the birth date of A. P. Peck—well known to our readers, to an astrological society on the West Coast. The members of this society drew up a horoscope for this birth date. In approximately thirty-nine pages of manuscript containing the report, there was not one single definite statement which was not contradicted elsewhere in the same manuscript. In one part it stated that the querist or subject was dead; in another that he was very ill and on page 14 it claimed that he was enjoying good health and on page 28 or 29 it stated that the querist would live to a ripe old age. How anyone can be dead, sick, alive and healthy at one and the same time is beyond our limited comprehension.

Every horoscope which we have seen has been nothing but a mass of nonsensical piffle, primarily designed to please the inquirer and give him just enough bombast so that he will be anxious to receive a further reading which will tickle his vanity even further. At the same time this tickles the pocketbook of the astrologer to the tune of anywhere from $5.00 to $100.00 or even more.

The movement of the planets around this earth and the gravitational pull between them is very slight. In fact, it is so weak that there is practically no effect on the movement of this earth in its orbit. Does anyone suppose that under the circumstances the planets could possibly affect human life? We are mere insects on this sphere of ours and if the sphere itself remains unaffected we also remain similarly uninfluenced. Why don't the astrologers take the moon into greater consideration and claim that the moon alone influences life on this earth? Is it not more reasonable to suppose that the moon, being so much nearer to this earth would affect every individual on this planet? Science admits today that the moon affects the tides. No doubt this view is universially held. So, if a mass of water can be caused to rise due to gravitational pull and if the earth itself can be slightly pulled out of its normal course by the gravitational influence of the moon on the earth, (and of course, similar influences of the earth on the moon), it might be plausible to assume that only this satellite affected human beings. As most astrologers argue, if the moon affects the earth, why cannot the planets affect man? Why should they if the planets do not affect the earth? The moon does affect the earth, yet the earth's satellite does not affect man at least no more so than the Woolworth Building.



"The Nation's Counselor."

PROF. GUSTAVE MEYER,

American Scientific Astrologer

Hoboken, N. J., August 2nd, 1926.

Miss J. K. Kraus,
34 - 18th Street,
Jackson Heights, N.Y.

My dear Miss Kraus.

According to the date of your birth, I find that you were born with the Zodiacal Signs of Aries, and Pisces rising, and as the ruling Planet of Aries is the fiery, evil, and martial Planet Mars, and of Pisces, the fiery, and fortunate Planet Jupiter, hence, Mars, and Jupiter, will be your ruling Planets through life, and while you would experience quite a turbulent, and hard up hill struggle, and more clouds than sunshine, during your younger years, and many narrow escapes from death by accident, illness, or operation, and serious trouble, and will usually have to fight for your rights, or work quite hard for whatever you legitimately earn yourself, and that your shoulders would usually have to bear the responsibilities of others

-7-

or loss is them indicated through or to relatives on your father's side, also through servants, or inferiors, if not through small animals.

During the early Autumn months, guard against public enemies, quarrels, legal trouble, reverses, and trouble or loss through the public, and the opposite sex.

During the late Autumn, you will be in danger of bereavement, and should guard against losses by fire, robbery, or systematic robbery, also guard well any plans, or secrets, you may possess or such will become exposed to others, who will profit through same, also avoid religious arguments, and guard your morals, health, and temper, and much trouble, or loss is indicated through something connected with either the Church, publishing, or advertising, science, creditors, and traveling by water, yet, you will receive much honor, credit, benefit, and success if not advancement in position.

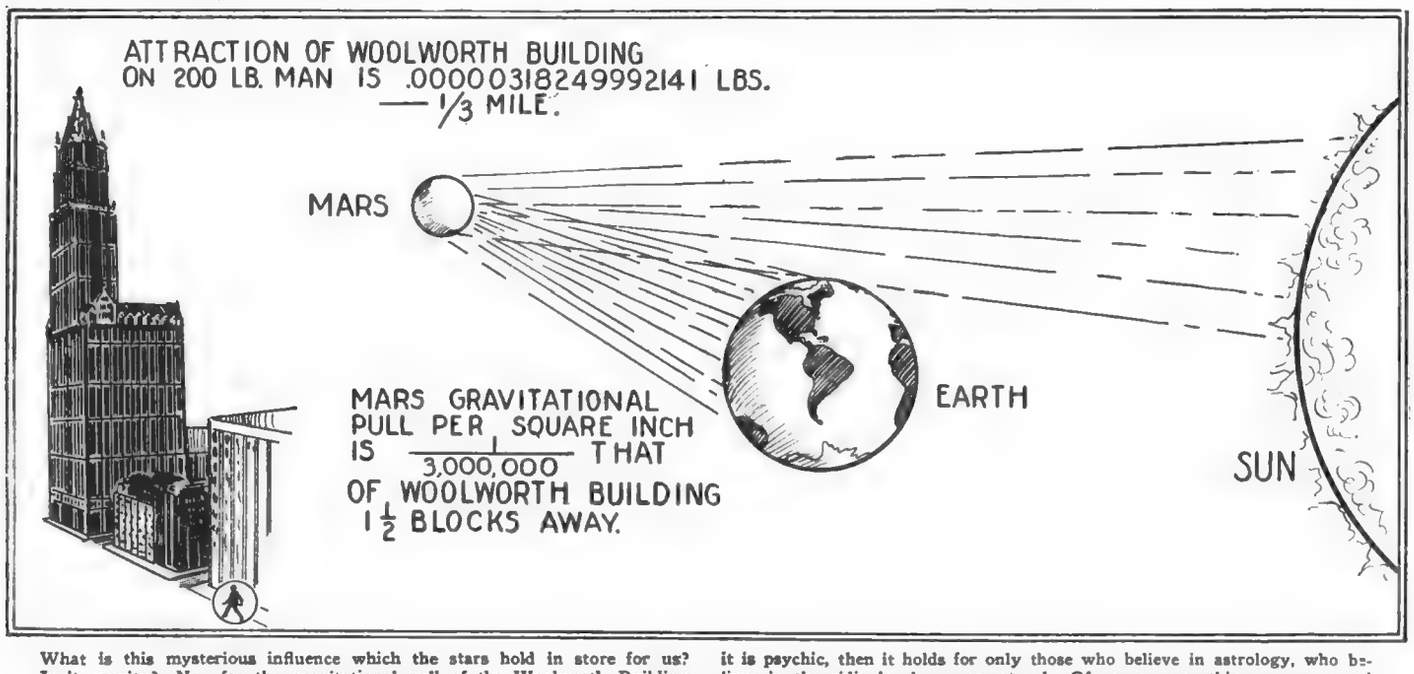
Yours truly,

Prof. G. Meyer

Scientific Astrologer.

At the left is a photographic copy of the first and last page of a horoscope as developed by Prof. Gustave Meyer who calls himself, "the Nation's Counselor." The birth date was absolutely accurate and correct to the minute, although a fictitious name was used. The author of this article prefixed his name with a Miss. The complete text of the horoscope will be found in this article.

Is there anyone so bold as to assume that he is born at a certain minute of a certain definite day and no one else in this entire world would be born at the same time? What has made Lieut. Becker a criminal when Paul Bartsch, naturalist; Joseph Frederick Berg, theologian; Robert Archibald Ashworth, clergyman; Gellert Alleman, chemist; James Pyper Bird, professor, etc., born during the same year and under the same sign are found in "Who's Who in America?" What has caused Lieut. Becker to be executed for his complicity in a murder case when these other men have attained high honors? Were the planets particularly unfavorable for one man and conveniently and accommodatingly changed in position when the others were born on the same date? The answer is of course apparent—"No!"



What is this mysterious influence which the stars hold in store for us? Is it gravity? No—for the gravitational pull of the Woolworth Building on man is considerably greater than that exerted by any of the planets. It cannot be light because the sun's rays are reflected from the planets. If it is psychic, then it holds for only those who believe in astrology, who believe in the ridiculously super-natural. Of course everything super-natural is not ridiculous. SCIENCE & INVENTION Magazine is willing to be shown that astrology is a science.

The Truth About Astrology

(Continued)

$6,000.00 for Proofs

There never was any science in astrology as we now know that term, and there will not be, and in order to prove this we are willing to pay $6,000 to the individual astrologer or to the astrological society producing a horoscope in accordance with the conditions of our award. Please bear in mind that these conditions are ones which any scientist would gladly adhere to were he given the opportunity to work something out on a scientific basis. If astrology is the science which astrologers claim it to be, then it should be a simple matter for them to make a definite statement, without frills, without contradictions and without indefiniteness. The astrologer should be able to say that there will be a railroad wreck at a definite time and location, in which a definite number of people would be injured. If the stars affect each individual they certainly should affect a railroad train to a greater extent. They should be particularly disturbing to a steamship where thousands of lives are located on the same vessel at the same time.

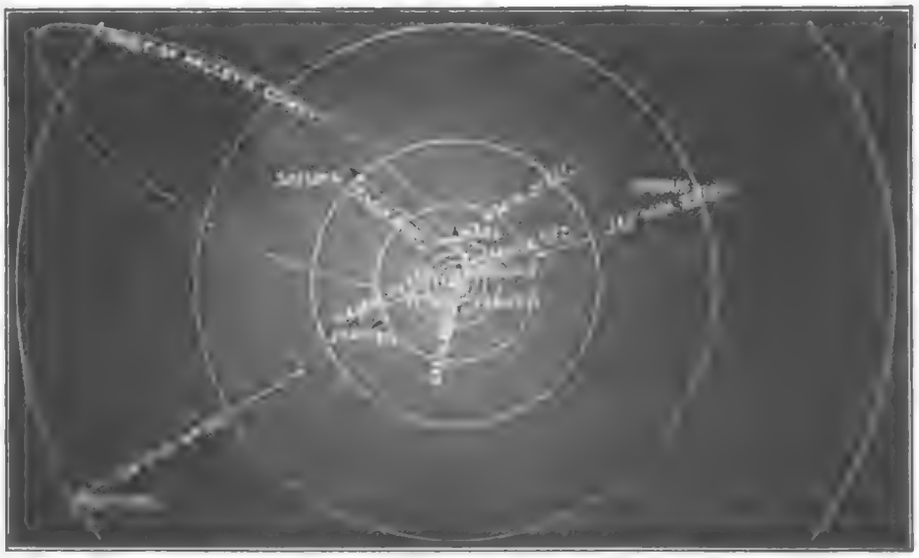
The astrologer should have been able to tell us definitely of the sinking of the Antinoe and should have been able to foretell of the daring sea rescue of Captain Fried and his crew on the "Roosevelt." But no, the astrologer will tell you "some vessel will be wrecked on the Atlantic Coast" and pick out a particularly hazardous part of the coast for his prediction. He doesn't say whether that vessel will have two souls aboard or two thousand, whether it is a canoe or a liner.

He may tell you that an attempt will be made at Mussolini's life and probably will be ninety per cent correct. It has been done before and undoubtedly will be done again, but he makes no attempt to prognosticate the exact date of the attack or the conditions or the individual guilty of the deed.

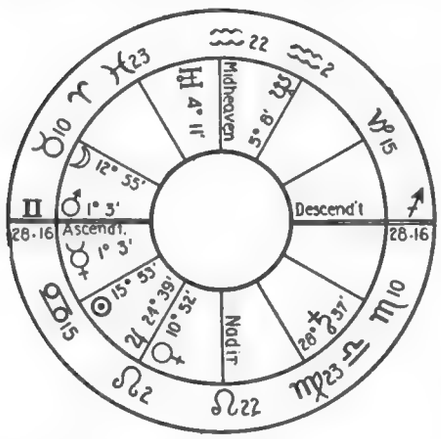
An astrologer may also tell you that the Mississippi River will overflow its banks during the spring of the following year and that there will be earthquake disturbances as well as volcanic eruptions. He doesn't name the volcano, nor the time of the event, nor say how serious the volcanic eruptions will be or the area which the earthquake would affect. Inasmuch as volcanic disturbances constantly occur and in view of the fact that earthquakes are perfectly natural the astrologer is bound to guess partly correct—but only as far as he goes and the difficulty is that he doesn't go far enough. He is just like a fortune-teller who states "you are about to cross water" and that crossing may be a river, a lake, the Atlantic or Pacific ocean or a rain pool.

Here is a typical sample of a horoscope. A girl, Florence B, was born on January 1st, 1899 at 10:20 A. M. These facts are known with exactness and were given to astrologers. We have had several horoscopes drawn up on her life. It so happened that on January 2nd, 1919, this young lady, Florence, *caught cold.* The cold was not of the ordinary variety but rapidly developed into pneumonia and pleurisy and on January 9th, 1919 *she died.* Not one of the horoscopes made mention of a lung condition. All of them tell of narrow *escapes* from death, accident, illness and operation and they advise her to guard against kidney trouble, nervous complaints, fire, burns and a galaxy of other conditions, yet previous to that time, she had *never* been ill in her entire life and never even had those conditions which one would class as the children's diseases. The first page of one of these horoscopes is here reproduced and the horoscope itself follows verbatim. In reading this "remarkable" horoscope note that the quotations in italics are ours.

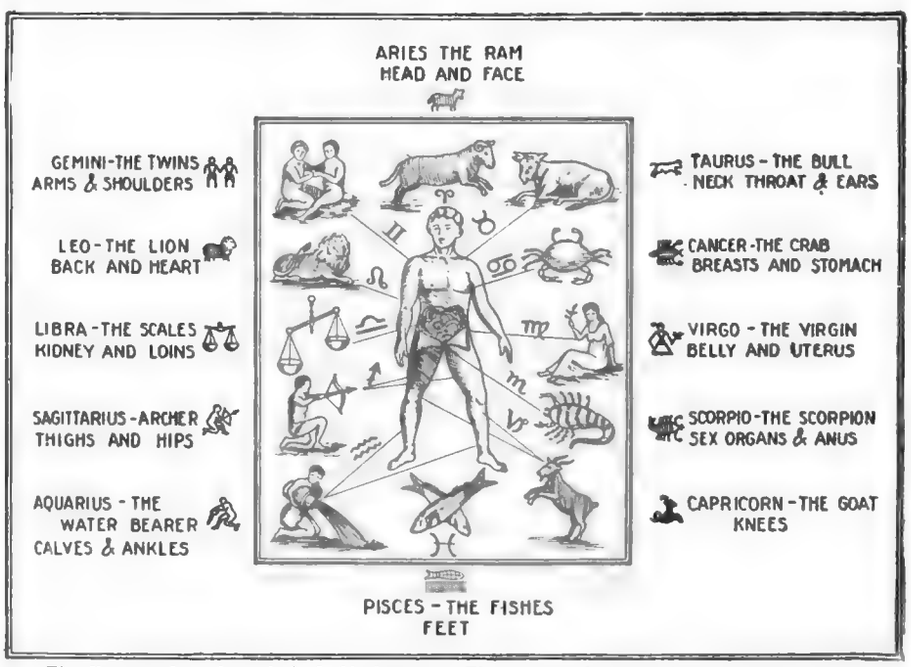
(*Continued on page* 562)



The above diagram illustrates the mean distance of the planets to the earth and the length of time that is would take for a beam of light to reach the earth from any of the planets. Thus if Jupiter is calculated to be in midheaven at the time of birth, it will be found that it passed midheaven more than four hours before it was even seen there. It takes light that long to reach us, assuming that the mean distance is used for the calculation. This distance will vary, dependent on the planets' positions.



The above diagram illustrates a typical horoscope. The various insignias just inside of the outer circle may be analyzed by referring to the diagram at the right. Thus the sign immediately at midheaven is aquarius, the water bearer, and this is supposed to control the calves and ankles. The peculiar ♅ just to the left of the word midheaven in the inner circle represents Uranus. The next symbol to the left is the moon, and continuing around we have Mars, Mercury, Sun, Jupiter and Venus, Saturn and Neptune.



The diagram above is typical of old almanacs. The organs which the signs control are given.

A Winter-Kitchen Garden

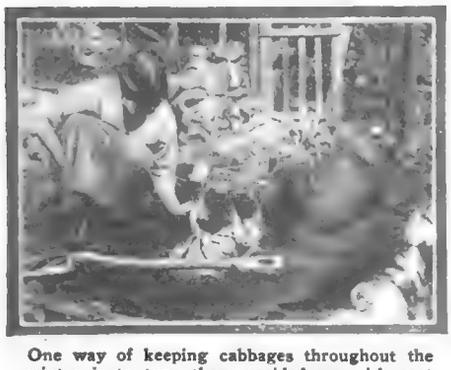
By DR. ERNEST BADE

Chives is one of the more common kitchen garden herbs used for salads and dressings and since it is comparatively easy to cultivate, it should not be lacking in the window garden.

THE first signs of the coming fall can be noticed in the garden. The leaves are turning yellow, the grapes are assuming a deep blue color while the fiery red cheeks of the apples peek through the foliage. The leaves of the potato are nearly all yellow, a sure sign that these tubers have ripened under the ground and that they can now be harvested.

The dry sunny days of fall are the days of harvest. But one should not begin too soon, for all fruit and vegetables which are to be kept for winter use, must be thoroughly ripe. Otherwise they can not be kept in the cellar for any length of time. On the other hand there are quite a number of vegetables which are not injured by the winter's frost. These are left in the garden, and, when needed, are removed on some frost-free day, when the ground is open. But even these types of vegetables are best covered with a slight protective coat of straw. The evil effect of freezing is less a result of low temperature than the result of sudden warming or heating of the frozen vegetables. The covering will prevent the sudden change of temperature due to the heating effect of the sun's rays. In any case it will be found advantageous not to reap the crop before the first slight frosts of autumn set in. The frost sets a period to the growth of the plant, it has thoroughly ripened and can be kept fresh much longer than if picked too early.

Vegetables kept for winter use must be perfect in every respect. When the heads of winter cabbage have a tendency to burst befor they are harvested, a condition prevalent during heavy rains in the fall, it becomes neccesary to bend the plants to one side and this is accomplished by exerting a sudden jerk. The growth is partially stopped because numerous tiny root hairs have been destroyed which prevent the absorbtion of sufficient moisture to burst the plant. The keeping of cabbages for winter use is best accomplished by removing the entire plant, roots and all, and placing them, roots upward and heads downward, in a shallow ditch or against same wall. Then they are covered with a layer of straw or of fallen leaves. Over this a layer of sand or soil about one foot thick is placed. In this way the cabbage can be kept throughout the entire winter.



One way of keeping cabbages throughout the winter is to turn them upsidedown with root pointing upward in a shallow ditch and cover with soil.

Leaf and tuberous vegetables such as carrots, turnips, etc., can also be kept in ditches which should have a depth of one and a half feet. The soil which is removed from the ditch is used to build a wall around it. In this cavity the vegetables are placed in the same relative position as they grew and they are strung out in rows. The excavation is covered with boards which in turn are covered with straw or fallen leaves and soil. It is best to place the boards over this ditch in such a way that they slope downward and outward so that rain water may drain away from the vegetables. Since the process of respiration is not completely inhibited during this period of rest, the excavation will be slightly heated. Therefore a ventilating pipe or two is placed at each extremity of the ditch to carry away the heated air.

Leek is another of the more important kitchen herbs. One, two or three of the more sturdy plants are planted in one pot.

Vegetables will keep for many months in such a ditch provided that none of them are removed while the air is extremely cold. It is also important not to close the ditch too soon. It should remain open as long as the air is warm. If this is not done the plants begin to grow and decay sets in.

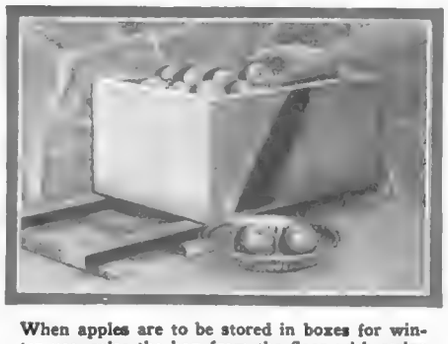
When vegetables are to be kept in the cellar, care must be taken to see that this place is well ventilated and dry. In damp and heated cellars the vegetables will certainly begin to decay in a very short time. When the atmosphere is mild, ventilation must be provided. In cool or frost-free cellars the vegetables are placed in sand or soil, if necessary, the sand is placed in boxes. If space is lacking frames are made, one above the other, where the vegetables may be kept. Potatos may be kept fresh by this method with absolute certainty, while celery is placed in sand. Carrots are kept in boxes or other containers, so that they may be covered with sand. Apples are spread on frames where they are placed one next to the other. If they are to be kept in boxes, then the apples must be carefully packed and the boxes placed upon strips of wood so that air may pass under the boxes whereby the condensing of moisture on the bottom of the box and rotting of the lower layers of apples is prevented.

Soupgreens is one of the necessities in the kitchen herb garden. Be sure to take only enough, when snipping the leaves, as is required. Do not waste the herbs.

Kitchen herbs for winter use are best kept in larger flower pots which, during the warmer days of autumn, may be kept out of doors either dug into the garden, or put into a window box just outside of the window until frost sets in. Then they can be brought into the kitchen and placed near the window, or they may be placed in the frost-free cellar near some well lighted windows.

Such a kitchen herb window garden consists of a number of such flower pots, each pot being placed on a saucer, first to protect the window sill from scratches, dirty spots, and stains caused by moisture, and secondary, for irrigating purposes, for these plants must also be watered at regular intervals. One pot of the following herbs will usually be suf-

(*Continued on page* 555)



When apples are to be stored in boxes for winter use, raise the box from the floor with strips of wood to prevent moisture from collecting under the boxes and causing the apples to rot.

How to Read Blueprints

PART 1—HOUSE PLANS

IN the present article we shall consider some of the interesting and practical points about reading architect's blueprints for house construction. In a later article we will take up the reading of shop blueprints for machinery. The public at large is becoming more interested in the subject of blueprints for houses than ever before. This is partly due to the fact that there are several large house-building concerns who sell all of the lumber cut to size, together with rafters and other parts, which are shipped several hundred or even thousands of miles perhaps, to the place where it is to be erected. Many people supervise their own building erection and if they do not do this, they will still be interested in learning how to read blueprints, so that they may tell beforehand just how the house is going to look, both inside and out. The drawings presented herewith are copies of blueprints for a house constructed by the writer in a town located about twenty-five miles from New York City. The plans call for a six-room bungalow style house with bath, and the garage is built in the rear part of the cellar.

The drawing below shows the various symbols used by architects for indicating brick, stucco, concrete, marble, terra cotta, earth, etc. Plaster or other walls are shown either in white on the blueprints or else in other cases they may be tinted a light blue, caused by the architect shading the wall section with a pencil on the original tracing. Architects do not follow all of these symbols implicitly, and you may find some variation on blueprints drawn by your architect.

Fig. 2 below shows the method of indicating bath tubs, shower baths, laundry tubs or trays, water closets, lavatories and kitchen sinks with drain boards. Doors and windows are usually recognizable even to those not familiar with blueprints of houses or other buildings, and Fig. 3 shows the principal accepted methods of illustrating various styles of doors. Reference to the large drawing on the opposite page shows how doors and windows as well as stairs are indicated on architectural blueprints.

Fig. 4 shows what is meant by scaling a blueprint. This is a simple little trick once you practise it a few times, using either an ordinary inch rule or else a boxwood scale, as supplied by stationery or drafting instrument concerns. As shown in Fig. 4 the scale there used is ¾ inch equals one foot. Hence each 1/16th is equal to one inch on the finished house. If you are going to read many blueprints, it will pay you to purchase a scale or two, such as ¼ inch to the foot; ⅜ inch to the foot, ½ inch to the foot and ¾ inch to the foot. A triangular scale carries all of these. Fig. 5 shows how chimneys are detailed on blueprints.

The large drawings on the opposite page show plan views of the house with six rooms and bath and also porch. You can obtain some practice by scaling off the rooms on this drawing by means of a piece of paper marked off in feet in accordance with the scale accompanying the floor plan. A special scale is provided for the semi-sectional view taken along the line A B indicated in the floor plan drawing. In looking at the sectional view it will be noted that the design of the doors, wood trim, etc., are shown as well as chimneys, posts supporting center girder under floor beams, etc.

This center girder is composed of three 2 x 8 inch girders spiked together. The rafters on the roof are spaced 16 inches center to center or outside centers (OC), which means measured from outer edge to outer edge of rafters. In reading dimensions of rooms, halls, etc., note whether dimension marks or arrows run to the surface of walls, or to the center line of walls.

The position of the electric lights in various rooms, halls and closets are generally indicated on all floor plan blueprints in the manner illustrated herewith. These general blueprints of houses do not, however, usually contain the details of where steam radiators, various side-wall electric outlets, etc., are to be located. The reason for this is that the plumber or heating engineer makes up special blueprints showing all the runs of the pipes and the exact location of radiators or hot air registers, if this system of heating is to be employed. You should make it a point to go over the blueprints with your plumber or heating engineer, and also the electrical layout blueprints with your electrician or electrical contractor, as there may be some things which you will not like once the house is finished. After you study blueprints a little and become accustomed to them you will find it relatively easy to understand about how a room will look with respect to the lighting fixtures as well as the plumbing and heating appointments. In some cases blueprints are either poorly printed or else not drawn in a clear manner, and then it is up to the prospective builder to ask his architect concerning any of the points which are not entirely clear.

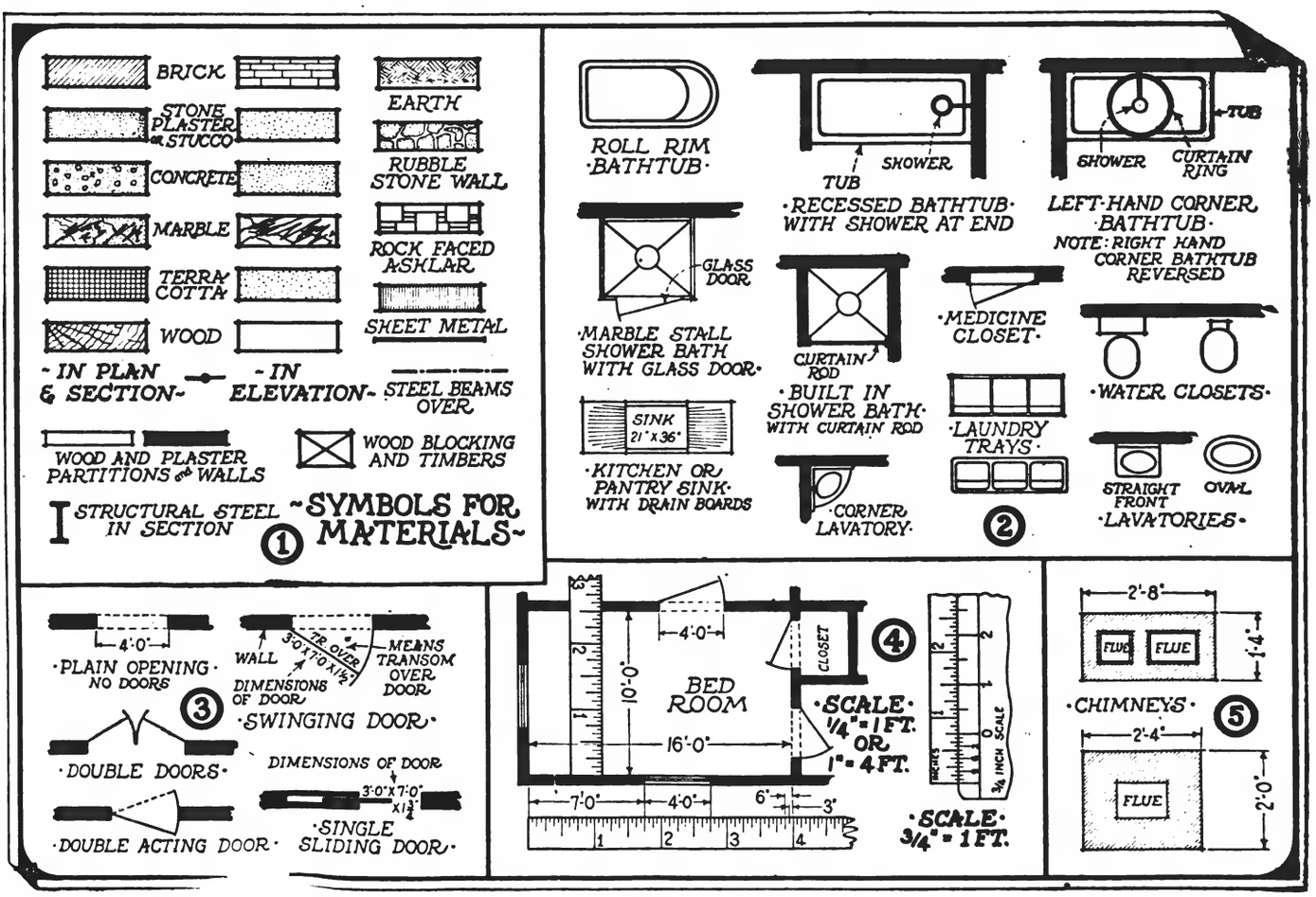
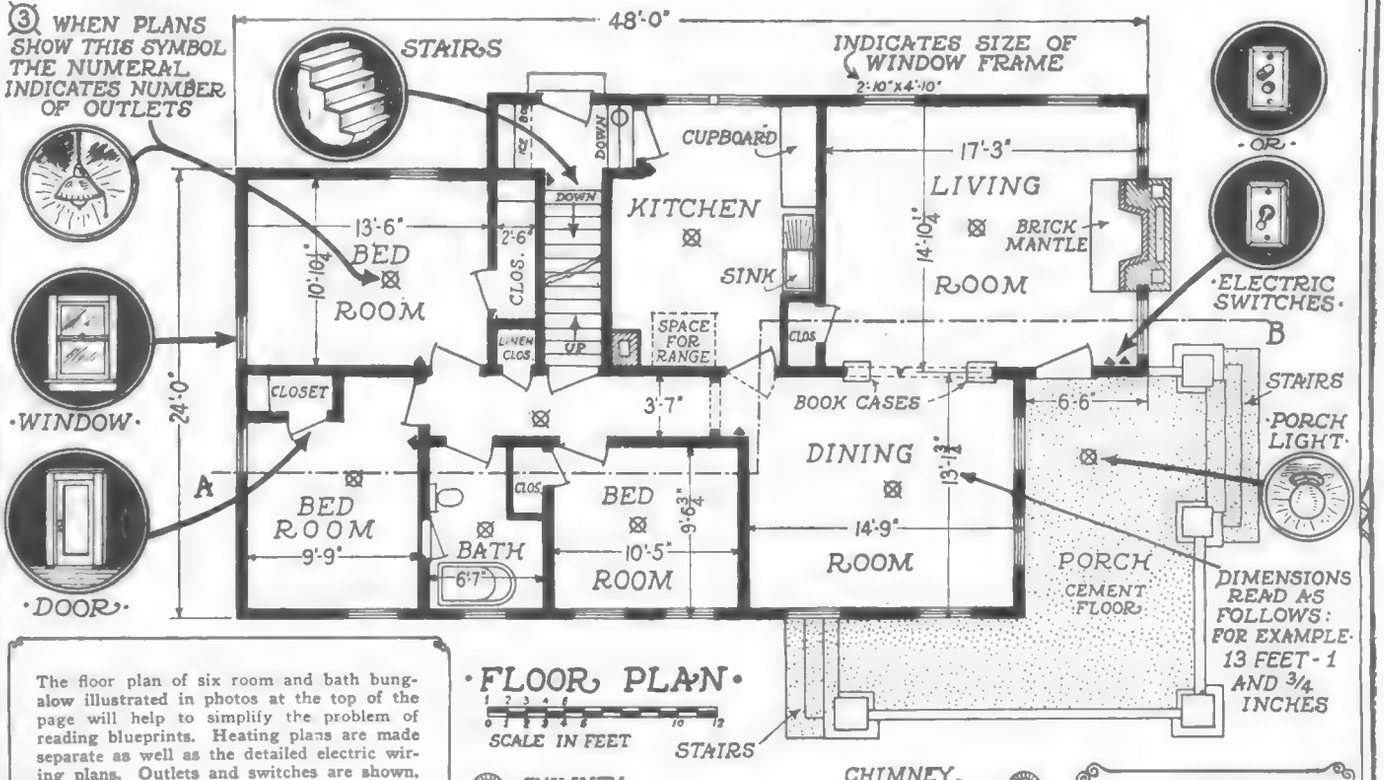


Fig. 1 above shows ... concrete, marble. ... 2 illustrates the ... bath, kitchen s... ...s used by architects to indicate brick, ... for houses and public buildings. Fig. ...ployed for indicating bath tub, shower ... blueprints. Fig. 3 shows how various styles of doors are drawn by architects, while Fig. 4 shows the meaning of scales in reference to plans and blueprints. With a common scale of ¼ inch equals one foot, 1/16th inch then equals 3 inches on the finished building. Fig. 5 shows how chimneys and flues are represented.

Blueprints of House Explained

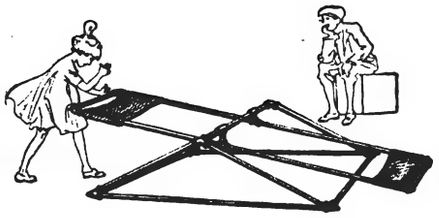
Front view of house, floor plans of which appear below.

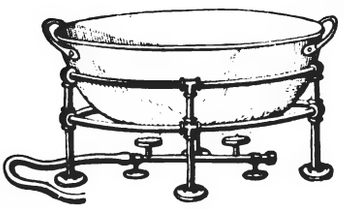
Photo above shows rear and grade door side of bungalow.

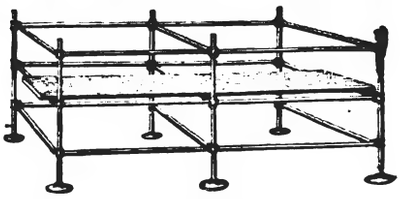


The floor plan of six room and bath bungalow illustrated in photos at the top of the page will help to simplify the problem of reading blueprints. Heating plans are made separate as well as the detailed electric wiring plans. Outlets and switches are shown.

A semi-sectional view of the residence here discussed is shown at left, this section being taken along the line A-B on the floor plan view above. Those interested in the subject of reading blueprints should procure a good book on the subject, and the editors will supply names of such treatises upon receipt of such request. Be careful to note where arrows on dimension lines terminate. Everyone should learn to read blueprints.

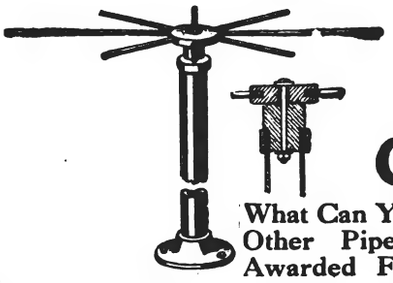


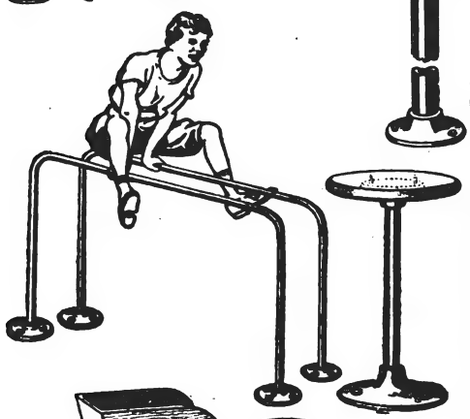


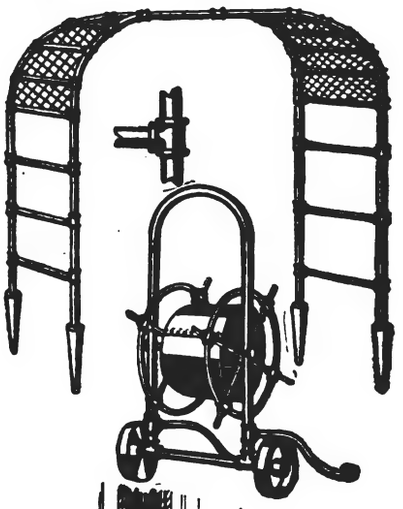


PRIZE PIPE CONTEST

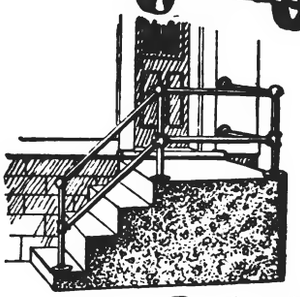
What Can You Make From Iron or Other Pipe? Prizes Will Be Awarded For the Best Designs Submitted.

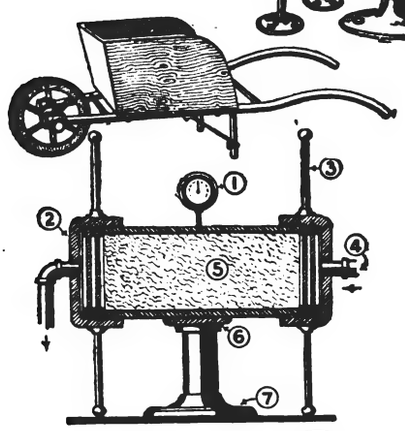


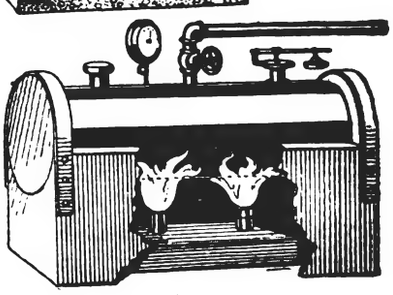




On this page are shown a number of uses for pipes and pipe fittings. We find in this series of illustrations reading from left to right at top of the page a swing, a see-saw, a large stand for holding a cauldron for the heating of chemicals and a suggestion for shelves. In the left-hand column we find a turnstile, a pair of parallel bars, a soda fountain seat, a wheelbarrow, a pressure oil filter in which oil enters at 4 and leaves at 2, after passing through the filtering substance at 5, and below this a hammer, a garden sprinkler, a latch and a leather punch illustrated in figures 1, 2, 3 and 4 respectively and a rack for holding a switchboard. At the bottom of this page a mechanism for agitating liquids is illustrated and to the right of this we find a lathe made entirely of pipe fittings, and a few wheels. On the right-hand column there is a rose arbor, a hose reel, a stair rail, a boiler for toy engines and a drill press. We are indebted to S. S. Kahn for this contest. Several of his suggestions appear on this page.







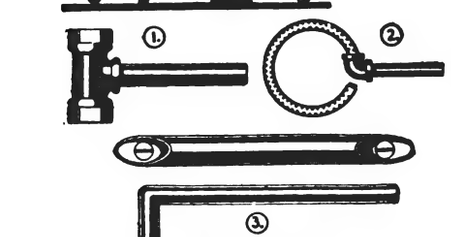
$100.00 in Prizes

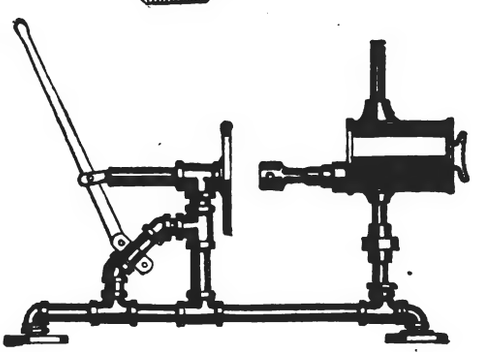
for suggestions for the use of pipes and pipe fittings. Ten prizes will be awarded for the ten best suggestions for the use of pipe and pipe fittings. Everyone may enter this contest and an entry consists of legible drawings and a description of not more than 200 words of the device constructed or suggested, 90% of which must be of pipe fittings. Photographs are highly desirable although not essential.

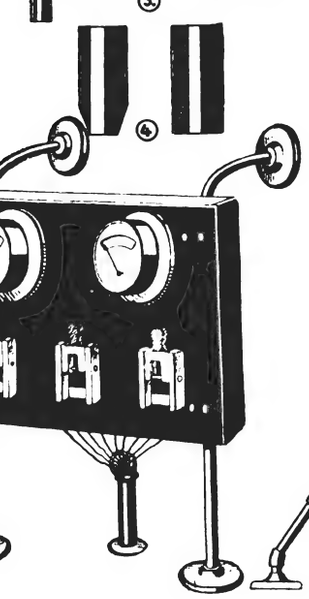
Any Contestant may submit as many designs as he desires. In event of a tie for any of the awards, an award of an identical nature with the prize tied for will be given to each contestant so tying. This Contest closes midnight of November 24th, 1926, and all entries must be in our hands by that time.

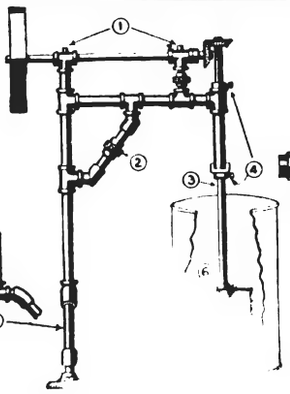
PRIZES

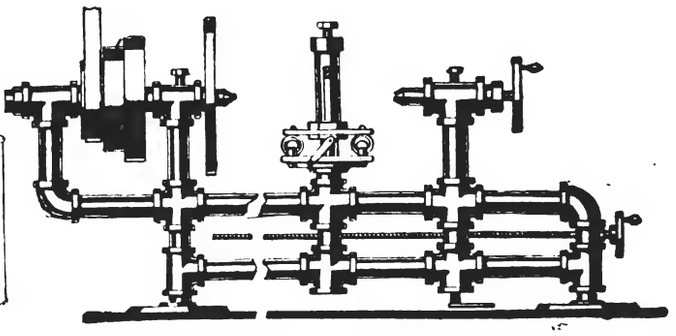
First Prize	$25.00
Second Prize	20.00
Third Prize	15.00
Fourth Prize	10.00
Fifth to Tenth Prizes, inclusive,	$5.00—$30.00
	$100.00







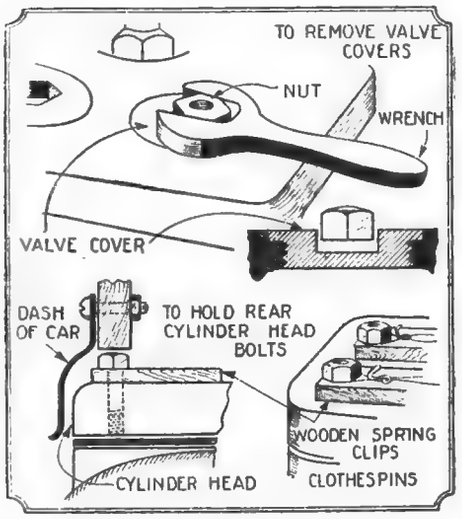




MOTOR HINTS

By GEORGE A. LUERS

A New Monthly Department Prepared by a Well-Known Automotive Engineer



Various methods of removing valve cages and cylinder head bolts.

FIRST AIDS WHEN WORKING ON CYLINDER HEADS

VALVE covers in the cylinder head are usually fitted with an inserted socket, requiring a special type of wrench for removal. Merely because this wrench is not at hand is no excuse for leaving the valves unground.

The appended sketch, shows a simple and most satisfactory substitute for the wrench, which means is avaliable to either the owner or the service station mechanic. A nut of a size to enter and fit the socket snugly, is used in conjunction with either an open end wrench or a monkey wrench. It is an easy obstacle to overcome when you just know the proper procedure.

On Ford cars and some other makes, cylinder head bolts interfere with the dash, vacuum tank and other close obstructions. It is necessary to remove the cylinder head and replace it with the bolt in its hole. To avoid such bolts dragging and mutilating the cylinder head gasket, is quite a feat. Often the head will be secured in place only to find that the gasket has been pulled and the water leaks out at the opening.

One of the most serviceable means for holding the bolts high enough to clear the gasket, is with wooden spring clips attached as shown.

OPERATING THE HORN SIMILAR TO THE ACCELERATOR

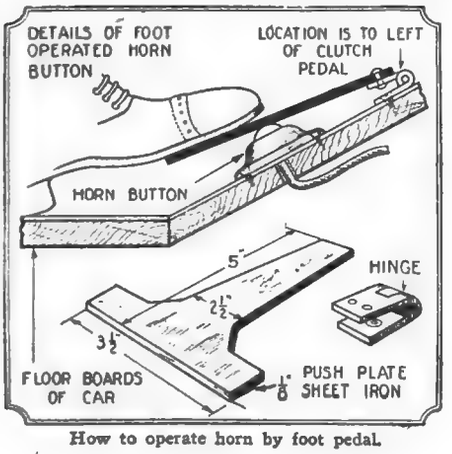
Possibly, no part of the car's equipment calls for more frequent use than the horn. Some towns and counties require the horn to be sounded at each road intersection.

When touring, it is advantageous to have a supplemental horn button placed on the floor of the car adjacent to the clutch pedal.

One of the best methods for operating this horn switch is with a lever extension, giving foot area, similar to an accelerator control.

The attached drawing shows in detail the method of obtaining this arrangement, which consists of an eighth inch sheet iron foot rest, hinged at the forward edge, with a small butt hinge, which rest is flared at the rear to give ample foot room.

In use it will be found that this horn control is far more serviceable than the hand button and also possesses a greater margin of safety through its accessibility and responsiveness.

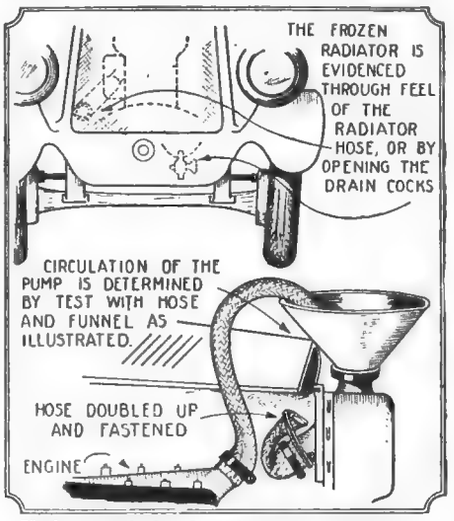


How to operate horn by foot pedal.

WATER CIRCULATION AND VARIOUS TESTS OF OPERATION

One of the motorist's chief difficulties with anti-freeze solution is the inability to determine when the solution is weak enough to freeze. On occasions the radiator is frozen. If the engine is started and run in this condition it may result with steaming and burst the radiator.

It is possible to safeguard against starting the engine when the circulating system fluid is frozen, by simple tests for fluidity.


THE FROZEN RADIATOR IS EVIDENCED THROUGH FEEL OF THE RADIATOR HOSE, OR BY OPENING THE DRAIN COCKS
CIRCULATION OF THE PUMP IS DETERMINED BY TEST WITH HOSE AND FUNNEL AS ILLUSTRATED.
HOSE DOUBLED UP AND FASTENED
ENGINE

Various methods of testing water circulation.

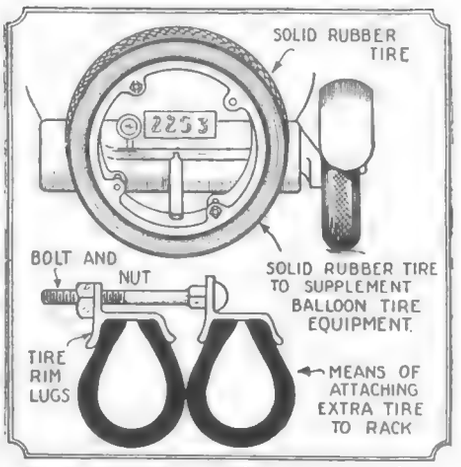
The lower petcock on the radiator of the circulating pump can be opened momentarily. Failure to flow is immediately indicative of frozen solution, that is where the drain is not clogged.

Once opened, the drain will not clog, if this procedure of opening it each time to test before starting the engine, is carried out.

Another practice which is of service, is a test at the rubber hose connections. Pressing the hose between his fingers, gives immediate evidence of the condition of the fluid inside.

What may happen when the engine is started when frozen, apart from the burst radiator, is that the impeller blades of the pump break and the circulation is rendered ineffective.

To test for a broken pump, is illustrated clearly in the attached sketch. In this the upper hose connection to the radiator is removed, a short length of rubber tubing connected to the outflow pipe from the engine, leads into a funnel at the filling spout of the radiator. The disconnected hose is doubled back and tied, thus improvising a stop for the flow of water.


SOLID RUBBER TIRE
BOLT AND NUT
SOLID RUBBER TIRE TO SUPPLEMENT BALLOON TIRE EQUIPMENT
TIRE RIM LUGS
MEANS OF ATTACHING EXTRA TIRE TO RACK

Simple means for carrying two spare tires.

When the engine is started, the action of the pump is to force a steady stream of water out of the hose and into the radiator.

SPARE TIRES AND SPARE TIRE CARRIERS

Balloon tires are offenders in the way of picking up many small tacks or other puncturing objects. To such an extent is this true, that drivers of cars with these light sidewall tires are most frequently found carrying two spares.

One driver has found it an advantage with his car to supplement the penumatic tire equipment with one spare solid type of tire on a standard rim.

To attach the extra tire to the usual tire rack and casing, a means which is favored by several motorists is that of using three or four long bolts and securing the lugs together as illustrated in the sketch.

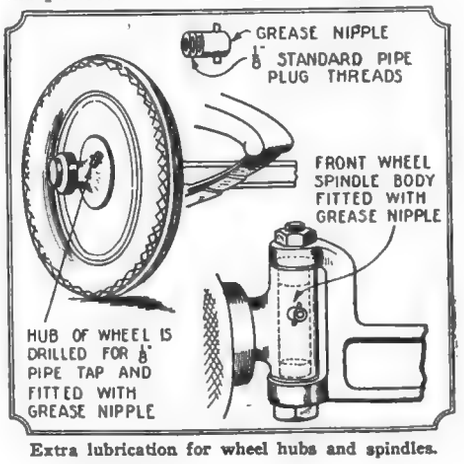
FORCE FEED GREASE NIPPLES

The wear of spindle bushings and the spindle bearings of front wheels is usually evident after ten thousand miles of driving. The lost motion in these parts, contributes to unsatisfactory steering and front wheel wabble or shimmy.

One force feed grease nipple is placed in the body of the wheel spindle between the upper and lower bushings. Another force feed grease nipple is placed in the hub of the wheel, with the grease hole leading through and into the space between the bearings.

Periodic filling of the open spaces with grease assures a constant supply of the lubricant to the bushings and bearings.

A 21/64-inch drilled hole through hub and spindle, followed with a ⅛-inch pipe tap fits the parts to receive the grease nipple.


GREASE NIPPLE
⅛" STANDARD PIPE PLUG THREADS
FRONT WHEEL SPINDLE BODY FITTED WITH GREASE NIPPLE
HUB OF WHEEL IS DRILLED FOR ⅛" PIPE TAP AND FITTED WITH GREASE NIPPLE

Extra lubrication for wheel hubs and spindles.

Simplified Safety Markers Easily Applied

This traffic officer is standing in security in the center of a safety ring laid out by a recently developed and extremely simple to apply, system of street marking.

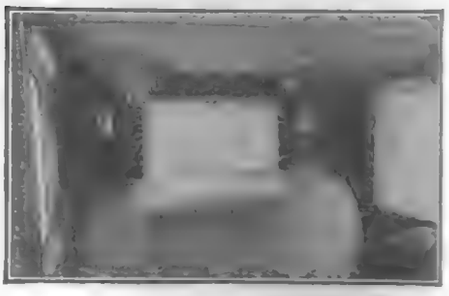
THE problem of adequately marking streets and highways to facilitate traffic control has been greatly simplified through the perfection of a new method of applying lines and markers. No preparation of the street surface is necessary, and all the necessary labor may be done by unskilled workmen. All the usual warnings are available.

THE letters are painted in white water-proof traffic paint on heavy canvas backing. The back of each letter is faced with a special adhesive which adheres very strongly to any type of pavement. These markers are available in all the usual forms, and may be applied by simply laying in place without the addition of heat or pressure. The cost of this type of marking is considerably less than the cost of painting traffic signs, and due to the ease of employment, traffic need not be delayed for more than a few minutes.

The policeman is keeping track of the length of time required to lay one of the new traffic signs. The only operation necessary is to place them in the proper position. The sun's heat and the weight of traffic does the rest. Insert shows use on cobblestone pavement.

—Wambler Corp

Auto Hat Rack

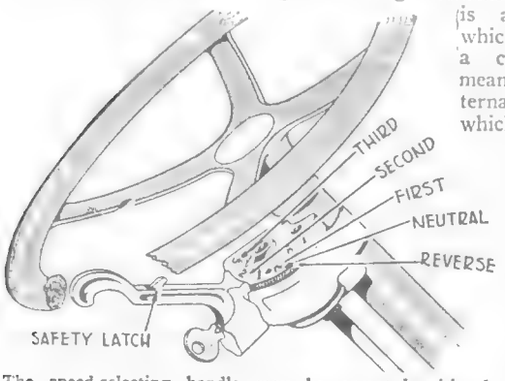


A new accessory for the automobile provides a place to put your hat so that it will not be crushed. The device consists of a heavy metal frame which clamps down over the brim of the hat and keeps it out of harm's way. An attractive nickeled finish is provided.

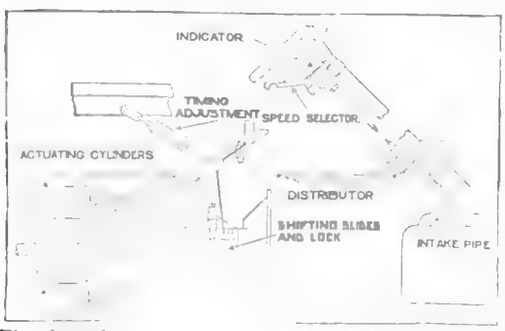
Safety Auto Hat Rack Co.

Vacuum Auto Gear Shift

A NEW automatic gear shift has been recently introduced which utilizes the partial vacuum created in the induction manifold of an internal combustion engine. In the vacuum gear shift this is effective by taking a lead from the intake pipe of the motor to a manually-operated valve, called the distributor, which in turn is connected with two cylinders which are of sufficient dimension to produce the necessary force to actuate the gear shifting mechanism. In each cylinder is an air-tight piston which is normally held in a central position by means of a coil spring externally mounted and which operates in either direction. When vacuum is applied to either end of the cylinder, the opposite end is automatically open to the air by the distributor. The whole operation is controlled by a small, speed-selecting handle mounted underneath the steering wheel. The actual shifting of gears is accomplished the instant the clutch is thrown out. There is no possibility of stripping gears. The reverse gear cannot be actuated until a special latch has been released. Thus there is no possibility of going into reverse unintentionally or accidentally. It can be put on any car.



The speed-selecting handle may be operated with the fingertips without removing the hands from the steering wheel. A protective lock is used.



The above d lation of the parts of the plete detail.

Compression Loss Micrometer

ONE of the latest products of a manufacturer of precision instruments is an indicator which gauges the compression and compression loss in automobile cylinders without disassembling the motor. The only connection to the motor is through a spark plug opening. With the aid of this device leaking valves may be discovered, scored cylinders tested, leaking piston-rings checked, and all other causes of compression loss located and the extent of the loss measured accurately. It makes possible and practical a diagnosis of the condition of your motor.

Leak Micrometer Corp.

The room was as silent as the tomb of a Pharaoh. Soon the table seemed to rise from the floor, slowly —slowly. The eyes of the medium were glued upon us.

Our Spiritualistic Investigations

By Dunninger.

No. 3 OF A SERIES

THE night was stormy and wending my way homeward as best I could, I was thinking that whatever was not fastened down this night would surely be blown away . . . including myself.

Weird shadows and fantastic shapes loomed ahead of me and my thoughts shifted to the spirit world.

Pleasant thoughts these . . . on a night like this.

Finally I managed to navigate myself into the house and was getting out of my wet clothes when the telephone rang.

"Hello," in a not too social-like voice I yelled into that important instrument of contact with the outside world.

"Dunninger," came the voice of a friend, "how would you like to go spook hunting tonight?"

"Not so you could notice it," I replied. "I just got in and am soaking wet."

"You will want to see this new phenomena I have unearthed, "went on the voice over the wire, "this is something that will make you sit up and give attention, Dunninger."

"Well . . . what is it?" I reluctantly queried.

"A creole that does the usual table lifting, materialization of forms and a dozen other mysterious things," came the answer.

"Where does she do her stuff?" I asked for the moment forgetting the deluge I had been caught in while homeward bound.

"Down here in Greenwich Village—just a bit East of 6th Ave. on 4th St.," replied my friend, "and Dunninger, I know the night is bad and all that but you must be on deck tonight at ten o'clock and see the fun."

"All right," I found myself saying, "meet me and we'll go around to the club and have a bite and from there on to this mystery woman's domain."

An hour later my friend was ushered in. He was as wet as a hen but his eyes shone with anticipated excitement of what was to come.

Into fresh clothes and off again into the night. A night that would do credit to the theatrical genius of a Belasco for a stage or screen effect. During a cheerful meal my friend and I went over the so-called phenomena of this new exponent of the Shadow World.

"I'll tell you nothing further," taunted my companion after we had discussed various phases of this creole's powers, "you'll see for yourself and then some."

On again we wended our way but this time from the interior a cab through the windows of which we could see the swirling rain all about us and the play of the wind blowing in its wake anything not secured. There a man lost his umbrella. Here a newsboy homeward bound tried to battle the elements and save his papers. There a woman and a man bravely battled against the storm and an unruly umbrella.

A fine night. Truly just the sort of night to remind one of the haunting spectres that stalk majestically through haunted houses, castles and what not.

The cab came to a standstill . . . drawn up before a most ominous looking house, somber, ghostlike, mysterious.

Alighting we looked up and down the street. Not a soul in sight. The storm was continuing merrily. We walked or truthfully we were actually blown . . . Up the steps. Ringing the bell we waited for a second or so. It seemed like an hour . . . and the wind now began to whistle some eerie tune with now and then the accompaniment of scraping of boxes being moved by the wind's power but which seemed to us as if it was a sort of chorus of rattling bones by skeleton musicians.

The door opened and we were ush

(*Continued on page* 536)

$21,000.00 for Spirits

More than two years ago SCIENCE AND INVENTION Magazine offered a prize of $11,000.00 to anyone who could demonstrate his or her ability to communicate with the spirits or to give some definite form of a psychical demonstration which in itself was not trickery.

The result has been that mediums and spiritual organizations have been afraid to place proofs before us. Those weak attempts which have been made to demonstrate psychical phenomena were almost instantly proven fraudulent, and no medium has dared to contradict our findings.

In view of these facts, should we not consider all mediums fraudulent? Should we not consider every psychical manifestation as being trickery pure and simple, intended primarily to fleece those who visit the circle and who find solace in the words from the worst forms of charlatans, namely those who are being permitted to practise upon the poor, seeking words from loved ones?

To the $10,000.00 which has been offered by Joseph F. Rinn through this publication for Spiritual proofs and the $1,000.00 in addition offered by SCIENCE AND INVENTION Magazine, we now add another $10,000.00.

Dunninger, who writes exclusively for SCIENCE AND INVENTION Magazine and who is the Chairman of our PSYCHICAL INVESTIGATION Committee will personally pay $10,000.00 to any medium or spiritualist who can present any psychical manifestation in so-called spiritualism, that he will not explain or that he cannot reproduce by natural means.

So now we have a total of $21,000.00 offered for proofs of Psychical Manifestations. Spiritualists—get busy.

Into the Fourth Dimension

SECOND INSTALLMENT

First American and Canadian Serial Rights

By RAY CUMMINGS

"I'm coming," said Will grimly. "It will do well to wait, for I shall be with it presently." He stood for a moment before the thing, contemplating it silently. Then he turned away, turned his back to it; and a new briskness came to his manner.

CHAPTER III
INTO THE SHADOWS

THERE were few preparations to make, for Wilton Grant had planned this thing very carefully. Our chief difficulty was with Bee. The girl was quite distraught; illness, the fear which for weeks had been dragging her down, completely submerged the scientist in her. And then abruptly she mastered herself, and smiled through her tears.

"That's more like it, Bee." Will glanced aside at me with relief. "I couldn't understand you. Why Bee, we've been working at this thing for years, and you—a real scientist, indefatigable."

"I'm all right now." She smiled at us—a brave smile though her lips were still trembling. "I'll not—disgrace you again. You're—about ready, aren't you?"

They had set aside a small room on the lower floor of the house—a sort of den which now was stripped of its accustomed hangings and furniture. It had two windows, looking out to the garden and lawn about the house. They were some six feet above the ground. It was a warm mid-summer evening; we had the lower sashes opened, but the shades fully drawn lest some neighbor or passerby observe us from without. On the floor of this room lay a mattress. There was a small table, a clock, two easy chairs. For the rest it was bare. Its white plaster walls, devoid of hangings, gave it somewhat the sanitary look of a room in a hospital.

We had been so occupied with Bee that Will had as yet given me no word of explanation. He left the little room now, returning in a moment with some articles which he deposited on the table. I eyed them silently; a shiver of fear, apprehension, awe—I could not define it—passed over me. Will had placed on the table a carafe of water; a glass; a small vial containing a number of tiny pellets; a cylindrical object with wires and terminal posts which had the appearance of a crude home-made battery—four wires each some ten feet in length, terminating each in a circular metallic band.

I glanced at Bee. Outwardly now she was quite composed. She smiled at me. "He'll explain in a moment. Rob. It's quite simple."

We were ready. By the clock on the table it was twenty minutes of ten. Will faced us.

"I'd like to start by ten o'clock," he began quietly. "The time-factor will be altered—I want to complete the difference—when I return—as closely as I can."

I had the ill grace to attempt an interruption, but he silenced me.

"Wait, Bob—twenty minutes is not a long time for what I have to say and do." He had motioned us to the easy chairs, and seated himself cross-legged on the mattress before us. His gaze was intent upon my face.

"This is not the moment for any detailed explanation, Rob. I need only say this: As I told you a while ago, the fundamental substance of which our bodies are composed is—not substance, but a mere vortex. A whirlpool, a vibration let me term it. And the quality of this vibration—this vortex—the time-factor controlling it, governs the material character of our conscious universe. From birth to death—from the beginning to the end—we and all the substance of our universe move along this unalterable, measured flow of time.

"Do I make my meaning clear? From—nothing but a vibrating whirlpool the magic of chemistry has built with this unalterable time-factor what we are pleased to call substance—material bodies. These material bodies have three varying dimensions—length, breadth and thickness. But each of them inherently is endowed also with the same basic time-factor. The rate of time-flow governing them, let me say, is identical."

He spoke now more slowly, with measured words as though very carefully to reach my understanding.

Into the Fourth Dimension

WHAT HAS GONE ON BEFORE

ROBERT MANSE, a correspondent in a New York Office of a Latin-American export house, in company with Wilton Grant and his sister Beatrice, nicknamed Bee for short, saw the first of the ghosts in February, 1946, a few miles from Rutland, Vermont. These ghosts were semi-transparent, glowing figures, much resembling human beings. Attempts to destroy them with bullets or clubs had no effect on the shadows. One could pass one's hand right through a ghost without feeling that there was any object in the vicinity. Later, the ghosts became more bold and more numerous, even molesting human beings and causing at least one death in Kansas, the direct result of heart failure, following the fright of encounter.

Sometime later, Will calls Rob on the telephone asking Rob to pay him a visit, claiming that his sister Bee is quite ill. During the visit Will makes mention that the ghosts or whatever they are have already arrived in the borderland between the consciousness of their realm and ours, and that they were coming out of this realm. Rob himself has discovered a means of entering into their borderland, whatever that may be and that even though his home is being watched by many of the ghosts, he will make the attempt tonight and turn these spirit-like creatures back into their former paths. While he takes the trip, Rob is to stay with Will's sister, Beatrice.

Now continue with the story.

"You must conceive clearly, Rob, that every material body in our universe is passing through its existence at the same rate. Now if we take any specific point in time—which is to say any particular instant of time—and place in it two material bodies, those two material bodies must of necessity occupy two separate portions of space. That's obvious isn't it? Two bodies cannot occupy the same space at the same time.

"Now Rob, I have spoken of this unalterable, measured flow of time along which all our substance is passing. But it is *not* unalterable. I have found a way of altering it."

He raised his hand against my murmur, and went on, carefully as before. "What does this do? It gives a different basic vibration to matter. It gives a different rate of time-flow, upon which, building up from a fundamental vortex of changed character, we reach substance—a state of matter—quite different from that upon which our present universe reposes. A different state of matter, Rob—it still has length, breadth and thickness—but a different flow of time.

"You follow me? Now, if we take a material body of this—call it secondary state, —and place it in the same space with a body of our primary state, they can and do occupy that space without conflict at the same instant of time.

"Why? Ah Rob, it would take a keener mind than mine or yours to answer that, or to answer the why of almost anything. The knowledge we poor mortals have is infinitesimal compared to the knowledge we have not, and never will have. I can conceive vaguely however, that two primary bodies, placed in identical points of space and time would be moving through time at identical rates and thus stay together and conflict. Whereas, with a primary and a secondary body, their differing time-flows would separate them after what we might call a mere infinitesimal instant of coincidence."

His gesture waved away that part of the subject. He rose to his feet. "I have particularized even more than I intended, Rob. Let me say now, only that the pellets in this little vial contain a chemical which acts upon the human organism in the way I have pictured. It alters the fundamental vibration upon which this substance—these bones, this flesh we call a body—this substance of my being, is built.

"Just a moment more, Rob, then you shall question me all you like. So much for the transmutation of organic substance. Inorganic substance—that table, my shirt, that glass of water—theoretically all of them could be transmuted as well. I have not, however, practically been able to accomplish that. But I have—invented, if you like, an inorganic substance which I can transmute. It is nameless; it is this."

He was coatless, and now he stripped off his white linen shirt. Like a bathing suit, he had on a low-cut, tight-fitting garment. It seemed a fabric thin as silk, yet I guessed that it was metallic, or akin to metal. A dull putty-color, but where the light struck it there was a gleam, a glow as of iridescence.

"This substance," he added, "I can—take with me, "He indicated the wires, the battery if such it were. "By momentarily charging it, Rob, with the current I have stored here. It is not electrical—though related to it of course—everything is—our very bodies themselves—a mere form of what we call electricity."

He was disrobing; the gleaming garment fitted him from shoulder to thigh. About his waist was a belt with pouches; in the pouches small objects all of this same putty-colored substance.

I burst out, "This is all very well. But how—how will you get back?"

"The effect will wear off," he answered. "The tendency of all matter, Rob, is to return to its original state. I conceive also that in the case of human organism, the mind—the will—to some extent may control it. Indeed I am not altogether sure but that the mind, properly developed, might control the entire transmutation. Perhaps in this secondary state, it can. I am leaving that to chance, to experimentation."

I said, "How long will you be gone?"

He considered that gravely. "Literally, Rob, there is no answer to that—but I know what you mean, of course. I may undergo a mental experience that will seem a day, a week, a month—measured by our present standards. But to you, sitting here waiting for me——" He shrugged. "By that clock there, an hour perhaps. Or five hours—I hope no more."

My mind was groping with all that he had said. I was confused. There was so much that I no more than vaguely half understood; so much that seemed just beyond the grasp of my comprehension. I seemed to have a thousand questions I would ask, yet scarce could I frame one of them intelligently. I said finally.

"You say you may be gone what will seem a day, yet by our clock here it will be only a few hours. This—this other state of existence then moves through time faster?"

"I conceive it so, yes."

"But then—are you going into the future, Will? Is that what it will be?"

He smiled, but at once was as grave as before. "Your mind is trying to reconcile two conditions irreconcilable. You may take an apple and try to add it to an orange and think you get two apple-oranges. But there is no such thing. Our future—let us call it that which has not yet happened to us but is going to happen. I cannot project myself into that. If I could—if I did—at once would the future be for me no longer the future, but the present.

"The conception is impossible. Or again —in this other state—I must of necessity exist always in the present. Nor can you compare them—reconcile one state of existence with the other." He stopped abruptly, then went on with his slow smile. "Don't you see, Rob, there are no words even, with which I can express what I am trying to make you realize. That being reclined there in the other room a while ago and watched us. Perhaps for what it conceived to be what we would conceive a day were we to experience it."

His smile turned whimsical. "The words become futile. Don't you see that? The future of that being is merely what has not yet happened to it. To compare that with our own consciousness is like trying to add an apple to an orange."

During all this Bee had sat watching us, listening to our talk, but had not spoken. And as, an hour before in the other room I had noticed her glancing fearsomely around. again now her gaze drifted away; and I heard her murmur.

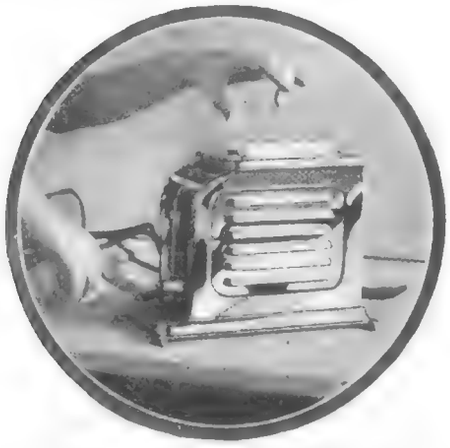
"Oh, I hoped it would be gone—not come to us in here!"

We followed her gaze. Standing perhaps a foot lower than the floor of our room and slightly behind the side wall was that self-same spectral figure. The intent to watch

(*Continued on page* 544)

"Good," said Will. He seated himself cross-legged in the center of the mattress. In an agony of confusion and helplessness I watched while Bee attached the four wires to the garment he wore, one on each of his upper arms, and about his thighs where the short trunks ended.

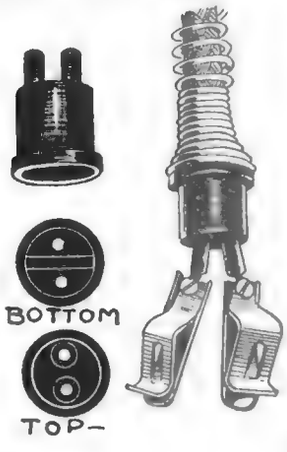
AUTOMATIC TOASTER



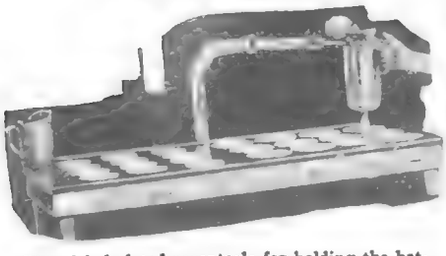
The editors took the remarkable toaster illustrated above apart in order to see how it operates. Inside there is a double heating element, the slice of bread being toasted on both sides at the same time. The small lever projecting from the front on the right side winds up a spring mechanism operating a clockwork-like mechanism. This is set by a knob immediately beneath the lever. When the desired time has elapsed, the lever at the right releases the one at the left, causing the toast to jump up and automatically shuts off the source of power. The switch is of carbon and self-adjustable. The toaster without a doubt is the finest thing on the market—Toastmaster.

JIFFY INSULATORS

For wiring irons, toasters, heaters, vacuum cleaners, lamps, etc., these rubber insulators may be very quickly applied to the wire. They are flexible and fit snugly. Ileite Electric Mfg. Co.



BATTER MIXER

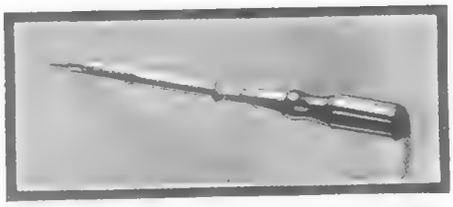


The nickel-plated receptacle for holding the batter is mounted on a stand provided with adjustable arms so that the device may be swung freely. A small motor on top mixes the batter and a trigger release permits the batter to pour out of the bottom of the receptacle onto the table stove. The device expedites pancake making in home with large families.—R. A. Moore.

PANCAKE TURNER

The turner illustrated above will enable the housewife to flip over a pancake very easily and quickly and will never cause the pancake to buckle up. It will be noted that a small button projects from the handle immediately under the thumb of the user. Pressing this button causes the turner to describe a complete arc.—R. A. Moore.

SCREW-DRIVER HOLDS SCREWS



A screw-driver which will securely hold a screw in juxtaposition with the driving shank is illustrated above. Nearly any size of screw with any type of head may be used in this tool.—Diversified Sales Co.

KNIFE SHARPENER

Two steel pieces arranged so as to form a V-shaped slot produce the sharpening edges for the above device.—R. A. Moore.

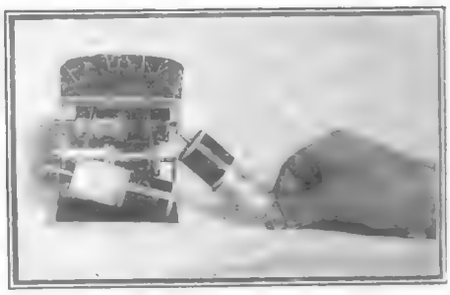
CREAM WHIPPER

A beater which will fit into a cup and in which the blades rotate in opposite directions, yet which is simply constructed and practically foolproof is the subject of the photograph above.—R. A. Moore.

COMBINATION CHAIR

The chair illustrated in the photograph above will accommodate a suitcase, a hat, an umbrella and an overcoat. The chair seat may be lifted so as to get at the hat. This combination should be ideal for the small home or for theatres and restaurants.

SPOOL HOLDER



In the spool holder illustrated in the above photograph a pin cushion is provided and it will be observed that there are springs in back of the spools, preventing them from rolling and unnecessarily releasing thread.—R. A. Moore.

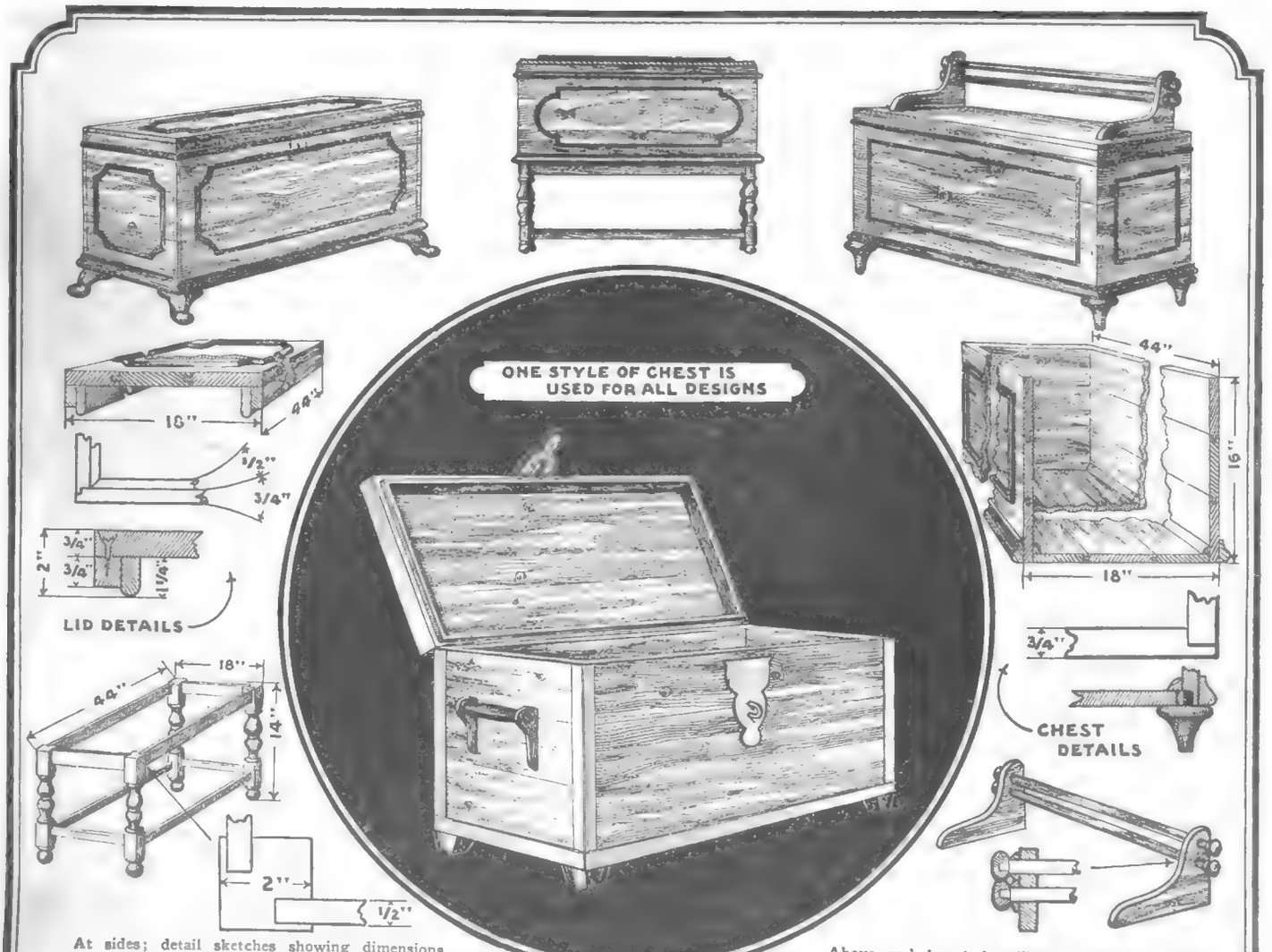
BOTTLE HOLDER

The interesting clamp here shown is for holding milk bottles and the like, the milk bottle being raised and pushed into the holder which closes around the neck of the bottle automatically. —R. A. Moore.

Home Mechanics

How to Build Cedar Chests

By WILLIAM M. BUTTERFIELD



At sides; detail sketches showing dimensions and cabinet work for fitting parts.

Above and in circle; illustrations of various possible designs using this chest.

ONE style and size of cedar chest is used for all of the four designs shown on this page. The chest is 44 inches long, 18 inches wide and 18 inches deep.

About 70 feet of 6½-inch cedar lumber, ¾ inch thick, and 11 feet of 2-inch cedar ½ inch thick, is required for the chest.

Other items for the various designs are as follows:

40 ft. ⅜-inch half round mahogany molding.

10 ft. 1 x 1½-inch o. g. mahogany nolding.

3 ft. 10-inch cedar board 1 inch thick (for back rest).

2 ft. 6-inch cedar board ¾ inch thick (for handles).

7 ft. 1-inch mahogany pole (for back est).

2 ft. 1-inch cedar pole (for handles).

26 ft. 4-inch sheet copper 1/16 thick (for binding, etc.)

2 ft. 7-inch sheet copper 1/16 thick (for locks, etc.)

1 2-inch copper padlock.

3 2-inch copper hinges (3 for each lid).

1 2-inch trunk lock (copper trimmed).

4 composition feet 5 inches high.

4 turned legs 6 inches high.

4 turned legs 14 inches long (mahogany).

22 feet 2-inch mahogany ½ inch thick (for leg frame).

The 6½-inch lumber should have a nug fitting tongue and groove and measure 6½ inches wide over all—the tongue and groove being ½ inch deep by ⅜ inch wide. This lumber is cut for 6 pieces 18¼ inches long and 12 pieces 44¼ inches long. Three of the short pieces glued together form an end piece for the chest and three long ones glued together form a front, back, top or bottom piece.

It will be found advisable to pay a small extra charge over the cost of lumber to have the tongue and groove cut by machine at the mill.

The gluing process can be very satisfactorily carried out on a level floor in a narrow hall—the baseboards along the hall on both sides acting as the jaws of a vise. By placing any three pieces properly fitted and glued against one baseboard, a very heavy squeezing or forcing pressure may be obtained by placing extra pieces against the opposite baseboard and driving wedges. Heavy weights placed on he piece to be glued will prevent it from 'dishing" while drying.

When they have been glued together the ix boards, each formed of 3 pieces, are cut, planed, sawed and smoothed in the usual way, or as a solid board. They are put together with glue and ⅛-inch brads.

The lid and chest are made first in one piece, that is, the height of the sides are nade 17½ inches to which a ¾-inch top is secured with glue and screws. The screws should be about 3 inches apart, each screw is covered with a cedar plug ½ inch round and ¼ inch thick. With the top the chest measures 18¼ inches in depth.

The lid is then sawed from the chest, sawing on a 1⅝-inch line. After smoothing the sawed edges and fitting the lid and chest closely together, the lip pieces are cut, shaped, and glued in place as shown in layout (lid details).

The bottom piece must fit snugly for it should be glued in place with ½-inch quarter-round molding glued in the top angles as shown (chest details).

Copper is a very popular trimming for

(*Continued on page* 560)

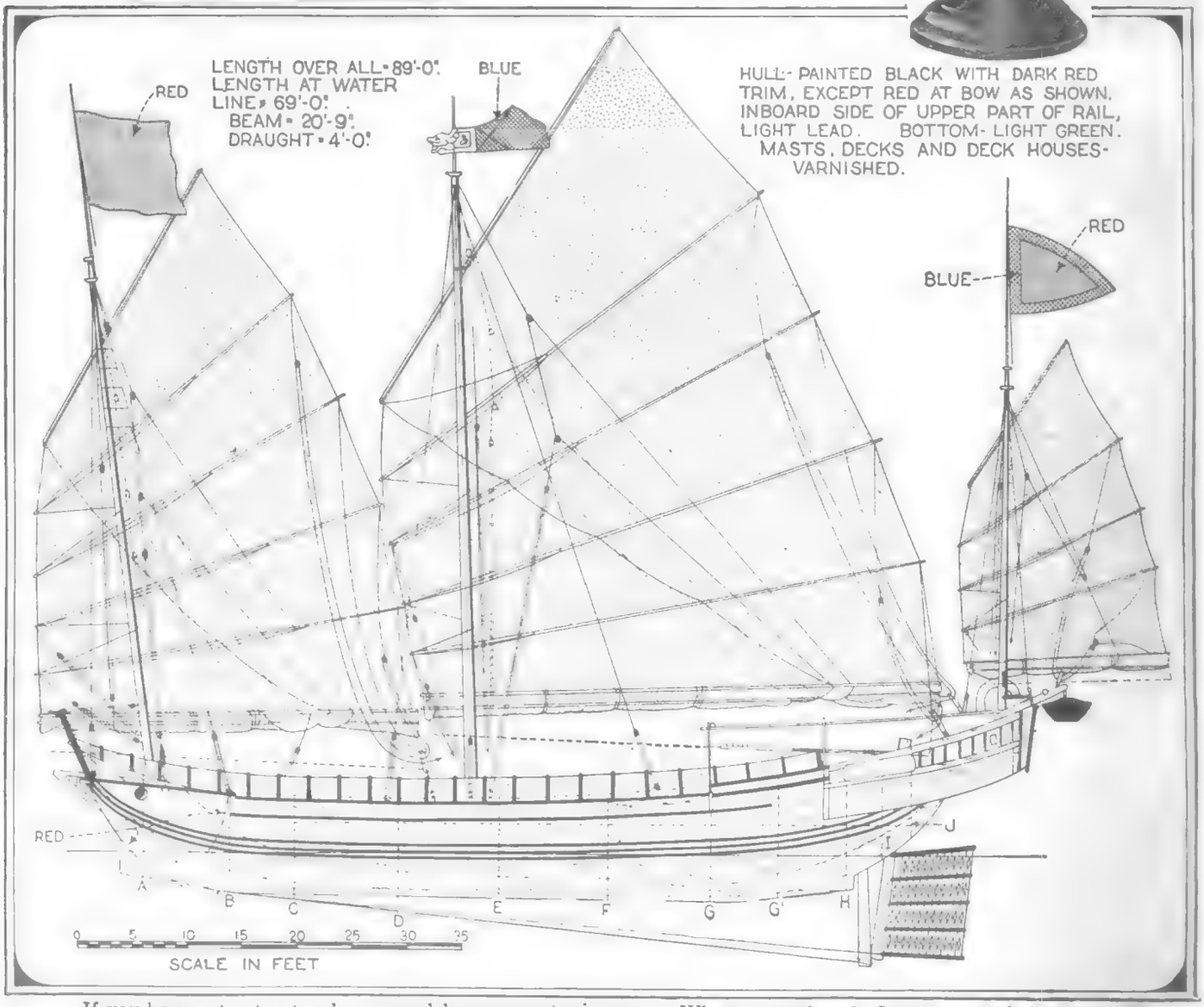
MODEL DEPARTMENT

Chinese Junk Wins this Month's Cup

Model Is Built by G. B. Douglas, of Montclair, N. J.

The photograph at the left shows this month's cup winner which is a model Chinese junk. The original vessel is eighty-nine feet over all, sixty-nine feet on the water line, and has a beam of twenty feet, nine inches, and a draught of four feet. The model itself is about twenty-three inches long over all. Mr. Douglas' work is exceptionally accurate and he is very careful and thorough. The cup which was awarded appears at the right.

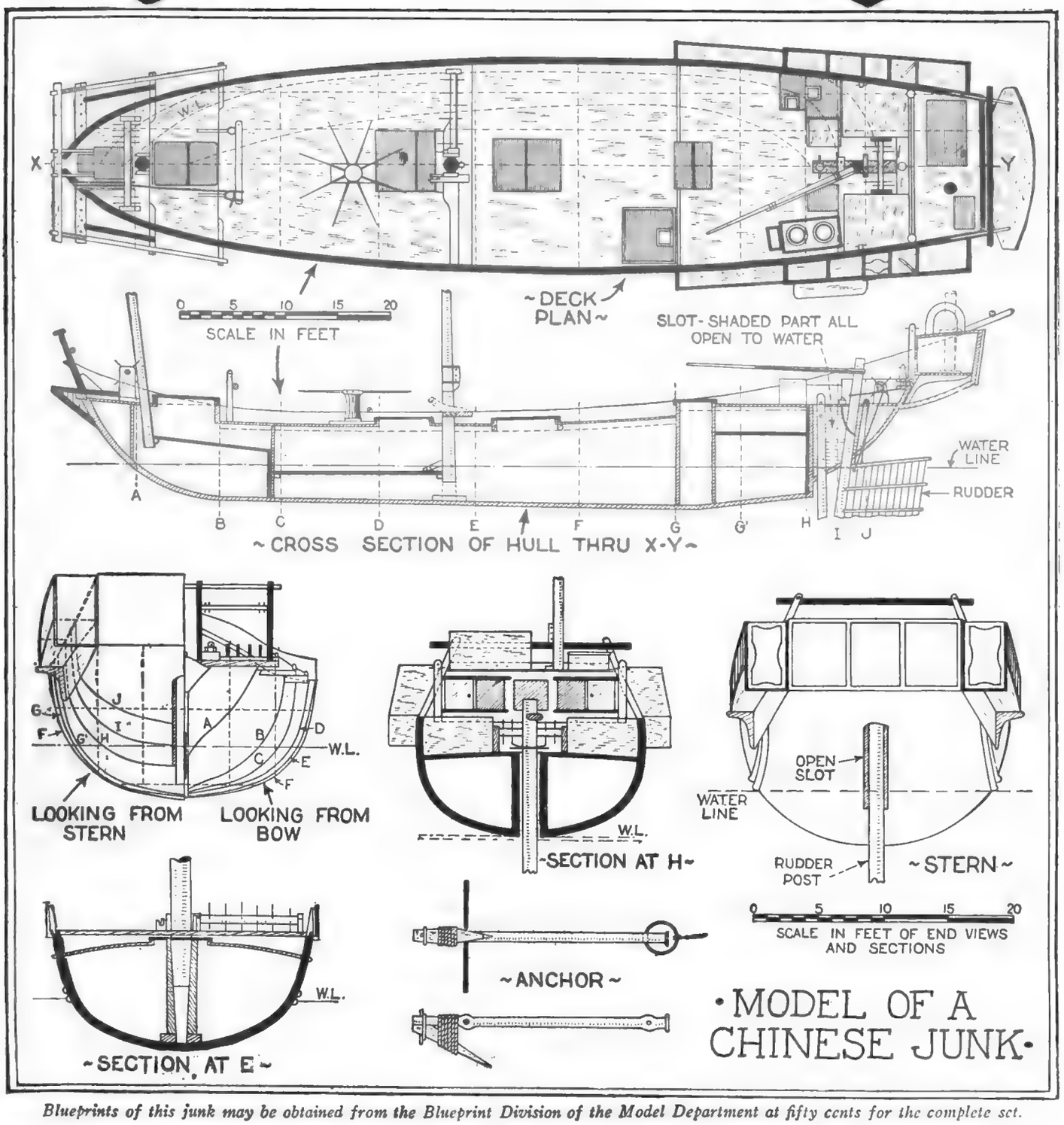
This cup is 17½ inches high. A cup is awarded monthly.


LENGTH OVER ALL • 89'-0".
LENGTH AT WATER LINE • 69'-0".
BEAM • 20'-9".
DRAUGHT • 4'-0".
RED
BLUE
HULL - PAINTED BLACK WITH DARK RED TRIM, EXCEPT RED AT BOW AS SHOWN. INBOARD SIDE OF UPPER PART OF RAIL, LIGHT LEAD. BOTTOM - LIGHT GREEN. MASTS, DECKS AND DECK HOUSES - VARNISHED.
RED
BLUE
RED
A B C D E F G G' H I J
0 5 10 15 20 25 30 35
SCALE IN FEET

If you have not yet entered your model you cannot win a cup. Why not get busy? See contest rules on page 565

The Cup Winner

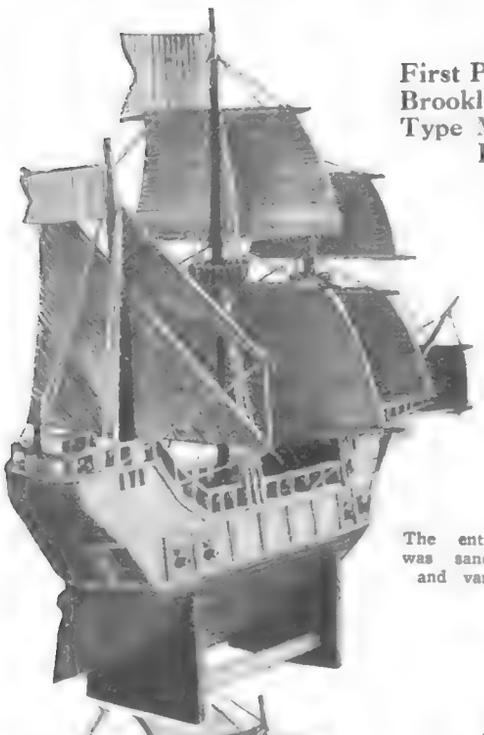
THE hull of Mr. Douglas' Chinese junk was made from a solid block and dug out. The side rail with the perpendicular pieces was made of white holly and the perpendiculars are match sticks. The fittings over the hanging sides were quite difficult to make in order to get them even. Two cooking pots on the deck are made from two five and ten cent store thimbles. These attract considerable attention. The people rarely see that the capstan and the mizzen mast is four feet off center, nor do they see that there is a windlass for hoisting sails, anchor and rudder. The rudder is a large affair hung from a windlass so that it may be raised when the boat enters shallow water. A bulkhead just forward of the rudder fills with water which prevents the ship from turning a somersault. All Chinese junks have eyes painted on the bow, for a Chinaman says, "No have eye, no can see. No can see, no can go." The slots in the rudder make it easier to move the rudder. Note that the foot of the mast does not go to the bottom of the vessel.



Blueprints of this junk may be obtained from the Blueprint Division of the Model Department at fifty cents for the complete set.

AWARDS IN $5,000.00 MATCHCRAFT CONTEST

First Prize $100.00 Is Won by H. Gerdts, of Brooklyn, N. Y., for His Model of an Old Type Man O' War. Construction Is One Hundred Per Cent. Matches.



THIS remarkable model is fourteen inches long and twelve inches high. There are 18,000 matches in its construction, and it took the builder, Mr. Gerdts, five and a half months working nights and Sundays, to complete it. The sails were built up over different size bottles so as to give them the natural curve. The matches for the ropes are split so as to make them much thinner, and the ladders, ropes and guns are all made of this material.

The comparative size of this remarkable model may be obtained by viewing the photograph of Miss Josephine Fitch who is holding the vessel.

The entire ship was sand-papered and varnished.

16 Monthly Prizes

First Prize	$100.00
Second Prize	75.00
Third Prize	50.00
Fourth Prize	35.00
Fifth Prize	25.00
Sixth Prize	20.00
Seventh Prize	15.00
Eighth Prize	12.50
9th to 16th Prizes of $10.00 each	$80.00

$5,000.00 Prize "Matchcraft" Contest

WATCH FOR PRIZES IN NOVEMBER ISSUE

FOR the present year, SCIENCE AND INVENTION magazine will award a total of $5,000 in prizes, in a new contest. You are asked to make models, fashioning the same entirely from safety matches. Please observe the following simple rules:

(1) Models submitted must contain at least 90 per cent. safety matches in their construction.

(2) Models made of toothpicks, paper matches, or non-safety matches, are not eligible in this contest.

(3) Models can not be built around boxes or other supporting articles. Walls, roofs, etc., must all be self-supporting and made of matches.

(4) All liquid adhesives, such as glue, shellac, cements, etc., are permissible.

(5) Models may be painted, gilded or silvered.

(6) Models may be of any size.

(7) In order to win a prize, it is necessary that either models be submitted, or, if this is not practical, owing to their size, a 5"x7" photograph of the model may be sent in lieu of the model itself. The best models submitted each month will be awarded the prizes scheduled herewith.

(8) All models submitted to SCIENCE AND INVENTION Magazine will be promptly returned to the builder, who will prepay all charges.

(9) Where SCIENCE AND INVENTION has any doubts as to the model (where photos only are submitted) complying with all the regulations, the judges may, at their discretion, request that the actual model be sent in for inspection, paying transportation charges both ways.

(10) This is a monthly contest, lasting for twelve months, each monthly contest closing on the first of the month following date of issue. Thus the contest for the month of October will close November 1, 1926, and prize winning announcements will be made in the January, 1927, issue. The November issue will contain August prize winning entries.

(11) Models must be shipped in a strong wooden box, never in a cardboard box, as SCIENCE AND INVENTION can not be held responsible for breakage in transit due to models having been improperly packed.

(12) When models are sent, be sure to affix tag, giving your name and address, to the model itself. In addition, put name and address on outside wrapper of package.

(13) Address all letters, packages, etc., to Editor, "Matchcraft" Contest, care SCIENCE AND INVENTION Magazine, 53 Park Place, New York.

IMPORTANT

QUITE a few matchcraft models from contestants arrive broken every month, due to faulty packing, or weak construction. It should be remembered that boxes are often violently thrown around in transit before they reach us. Make sure first that your model is constructed strongly enough to withstand severe shocks. Then, before you send us the model, after you have it packed as well as you know how, throw it up almost to the ceiling and let it come down on the floor. Open up the box and see if the model is not damaged. Only after such a test can you know that the model will arrive safely.

All First Prize Awards will henceforth become the property of the Experimenter Publishing Company and will be used for exhibition purposes.

Caution—Soak or cut heads from matches before building your model so that the models may be expressed or mailed. The strike-everywhere square cut Liberty matches can be used if the heads are cut off.

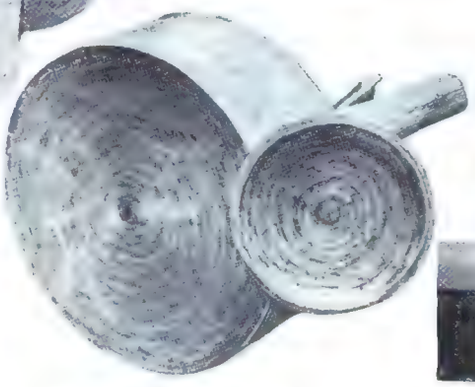
This contest started Dec. 1, 1925, and will terminate Dec. 1, 1926.

REMEMBER—This is a monthly contest offering sixteen prizes every month. Don't hesitate, send in your model now!

MATCHCRAFT AWARDS

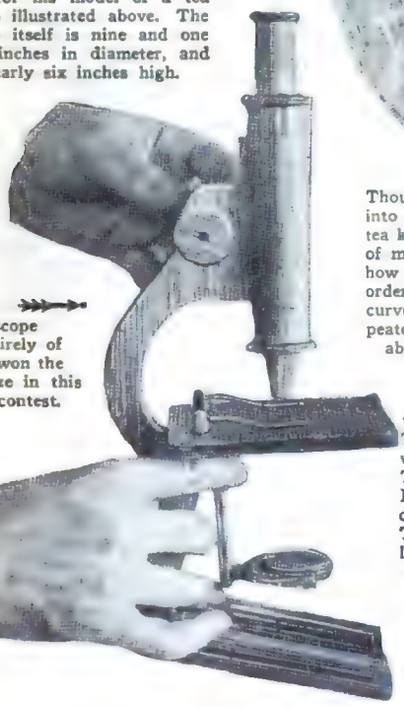
Tea Kettle Wins Second Prize $75.00—Microscope Third $50.00 and Lynx Head Plaque Fourth $35.00 In This Month's Contest.

SECOND PRIZE—$75.00 is awarded this month to Fred Spinden, of Abington, Illinois, for his model of a tea kettle illustrated above. The kettle itself is nine and one half inches in diameter, and nearly six inches high.



Thousands of matches entered into the construction of the tea kettle. Only a single layer of matches was used. Notice how each match was bent in order to give the kettle its curve. Mr. Spinden has repeatedly demonstrated his ability to bend matches.

The second prize entry is here held by Miss S. Bernstein.



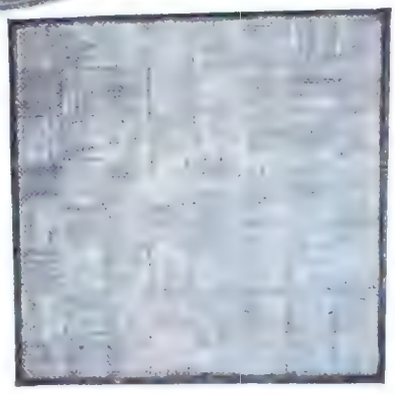
A microscope made entirely of matches won the third prize in this month's contest.

THIRD PRIZE—$50.00 was awarded to Henry C. Thomas, of Charleston, North Carolina, for the construction at the left. The side holders are linked and the angle of the scope is adjustable.

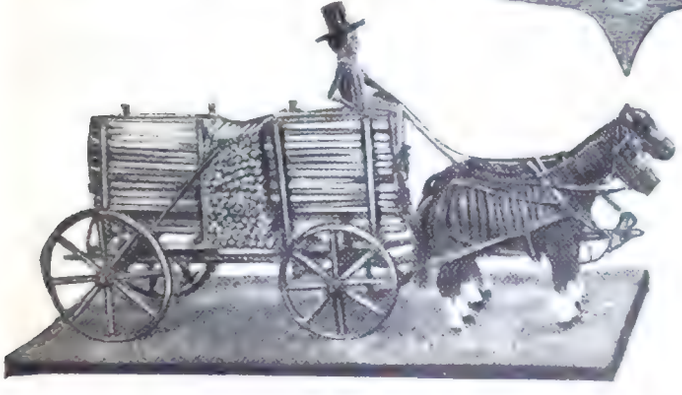
FOURTH PRIZE—$35.00 was won by Dr. E. Bade of Glen Head, L. I., for the lynx head plaque here illustrated which is just big enough to cover a cone speaker, although it may be used for a tray. The matches were carefully cut and bent and then glued in place so as to produce this artistic design.

TWELFTH PRIZE—$10.00 is awarded to J. White, of Rochester, N. Y., for the sailor's sweetheart frame made up of several layers of matches. By means of a scroll saw the heart is cut out and the picture inserted under celluloid. A back of matches is then glued in place.

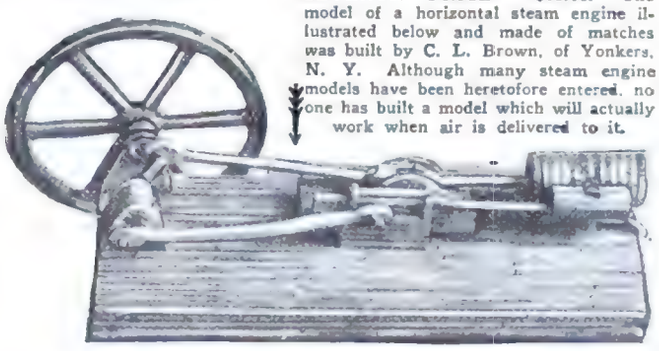
SIXTH PRIZE—$20.00 was the award decided upon for the checkerboard here illustrated and built by Victor Roman, of New York City. Note that the matches in adjacent squares are laid at right angles to each other. Half the number of squares could be stained black for greater contrast.



EIGHTH PRIZE—$12.50 was won by C. F. Ewers, of Portland, Oregon, for the team of horses pulling a truck load of matchwood illustrated below.



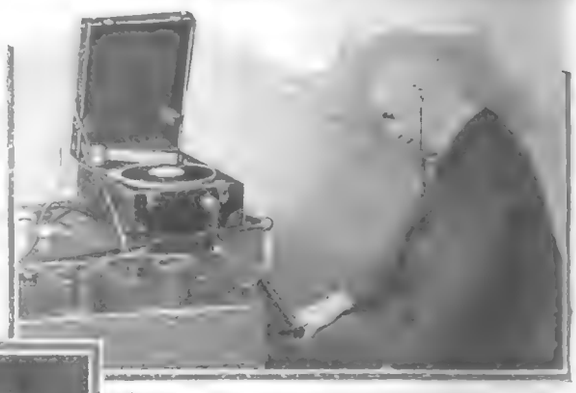
SEVENTH PRIZE — $15.00. The model of a horizontal steam engine illustrated below and made of matches was built by C. L. Brown, of Yonkers, N. Y. Although many steam engine models have been heretofore entered, no one has built a model which will actually work when air is delivered to it.



Science Snapshots

Dancers and orchestra leaders should welcome the innovation shown in the photo at the left. This machine controls the tempo of the orchestra and indicates the speed at which the music is being played. The two dials seen on the front of the cabinet are indicators. The left dial shows the number of beats per minute so that the orchestra will not exceed the normal pace, while the dial on the right is connected to a pendulum which beats the time.

A remarkable piece of apparatus which brings science one step nearer to solving the secrets of the weather has been developed by Dr. Charles G. Abbot of the Smithsonian Institute. The "sun gun" shown at the right is an instrument which measures the amount of heat given off by the sun. He has found that this amount varies from day to day, and greater accuracy in long range weather forecasting is now anticipated.



Below is shown a typewriter which may be converted into a machine for writing Braille characters by throwing a lever. The carriage is arranged in the same fashion as on the standard typewriter and manuscripts in the usual kind of type may be written without changing the machine.

The unusual looking typewriter at the right is designed to write the characters of the alphabet used by the blind. This system of writing, called the Braille system, employs a series of dots raised from the surface of the paper in different combinations to represent the various letters of the alphabet. The dots are punched by the six large keys, the seventh being a spacer key.

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The Testing of Wood and Grain Alcohols

By DR. E. BADE

IT is not at all difficult to distinguish between wood and grain alcohol or to detect the presence of wood alcohol in grain alcohol by a chemical reaction. Wood alcohol, as its name signifies, is de-

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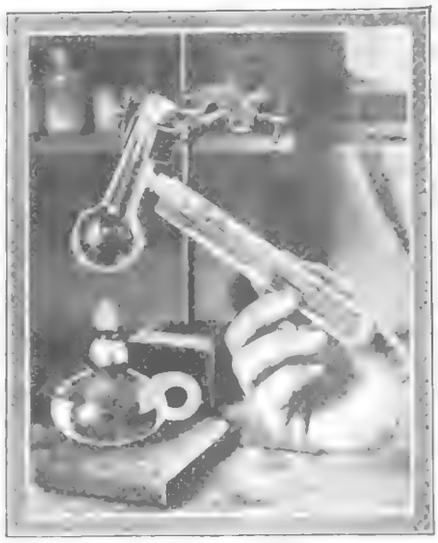
rived from wood, while grain alcohol is usually and most commonly, although not always, derived from the fermentation of the starch in grain or potatoes with the aid of malt. But this ethyl or grain alcohol may also be prepared from wood. In this process non-resinous wood, or wood from which the

Add methyl orange to alcohol in test for acid.

resin has been extracted, is cut into small fragments and placed in a digester. A small amount of sulphuric acid is added and steam is permitted to enter. By careful regulation of the strength of the acid and the temperature, the wood or cellulose combines with the water by means of the acid present and producing a simple sugar.

The substances in the digester are now treated with water which dissolves the acid and the sugar. After filtration the acid is neutralized with lime, and the sugar is changed to grain alcohol by fermentation.

Some of the impurities found in methyl alcohol are aldehyde, dimethyl acetate, acetone, higher ketones and chloroform. As a rule, especially for chemical work, the wood alcohol should be free from acetone. In order to test the alcohol, a color reaction is used, which will give a reaction for acetone, aldehyde and acetic acid. When 1% of acetone is present the color will be yellow-orange when a solution of sodium nitro ferrocyanide (nitroprusside) is added. If acetic acid is present, a pale tint of red is developed which, after twenty minutes will



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The presence of acid or alkali is detected with the aid of phenolphthalein, litmus, or methyl orange, litmus being least sensitive.

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Dilute the alcoholic distillate with 5 cc of water, keep test tube cold, and plunge a spiral of red hot copper wire into the tube.

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Filter after dipping the copper spiral.

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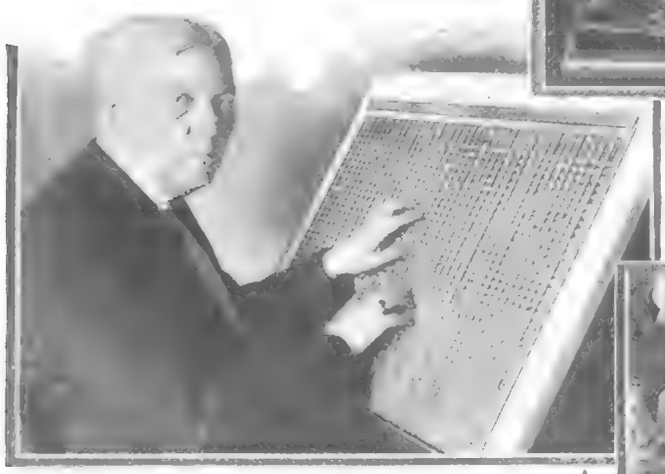

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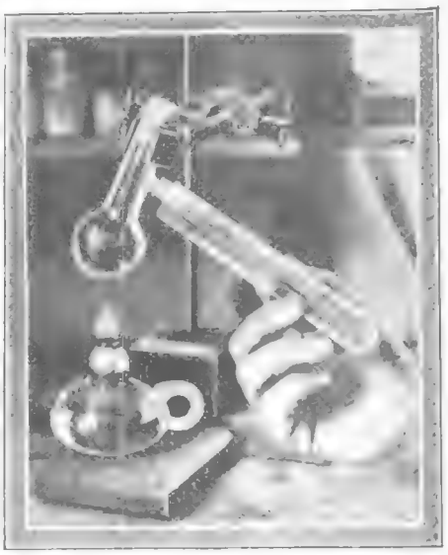

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Dilute the alcoholic distillate with 5 cc of water, keep test tube cold, and plunge a spiral of red hot copper wire into the tube.

Filter after dipping the copper spiral.

water. Insert the small tube into the cold water and heat a small spiral of copper wire to red heat over a flame and quickly quench the metal in the alcohol solution which has been distilled off. Do this about five or six times and then filter the now oxidized solu-

Boil the solution after the wire has been withdrawn.

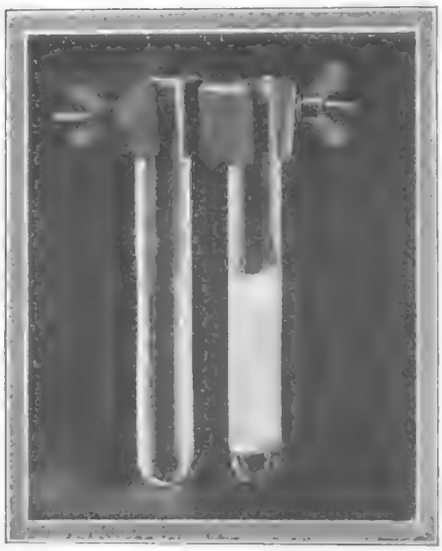
tion. Boil for about one minute. Cool the solution and add 2 drops of a 0.5% resorcinol solution in water. Mix and carefully add two or three cc. of concentrated sulphuric acid in such a way that the acid runs to the bottom of the solution without mixing. Let the tube stand about three minutes. If no rose-colored ring has developed, less than 2% of wood alcohol is present, and if the ring develops within ten or fifteen minutes about 0.1% of wood alcohol is present. A yellowish brown ring, which may develop, is due to acetaldehyde produced by the oxidation of the ethyl alcohol and which may not have been completely driven off by boiling. The ring must be rose red in color to show the presence of wood alcohol. In this case the wood alcohol is oxidized to formaldehyde.

The presence of aldehydes can usually be detected with the aid of a few drops of silver nitrate solution. After the liquid has been exposed to the light for 24 hours, the silver will be reduced to a black powder if aldehydes or other reducing agents were present.

Pyridine, which has been partially rectified, or bone oil, which contains a large amount of pyridine, is frequently used as a denaturant and its presence may be detected by the abundant crystal formation which is developed when 10 cc. of the alcohol is treated with 5 cc. of a 5% solution of anhydrous cadmium chloride solution. The needle-like crystals are produced within 10 minutes when pyridine is present.

Add a dilute solution of the resorcinol and then concentrated sulphuric acid, poured down the side of the test tube so as to sink to the bottom.

Amyl alcohol, otherwise known as fusel oil, can be detected in quantities as low as 0.05% when care is exercised during the operation of analysis. Five cc. of the alcohol are taken and diluted with 6 cc. of water. To this mixture 15 to 20 cc. of chloroform is added. The whole is thoroughly shaken up and the chloroform is then removed by decantation or by means of a separatory funnel. The chloroform in which the amyl alcohol is dissolved by this treatment, is evaporated in a watch crystal on a water bath and the fusel oil is left behind.



When wood alcohol is present in ethyl alcohol then a rose red ring is developed as well as rose colored flocks. The tube on the left shows the results obtained when no wood alcohol is present, and the tube on the right shows the presence of large quantities of wood alcohol.

Methods of Testing Milk

By JOE SILL

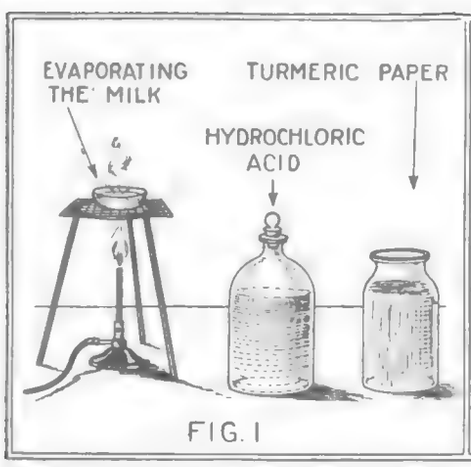


Fig. 1. Turmeric paper which is turned brownish-red by alkalies, curiously enough is turned almost the same color by an acid solution of boric acid.

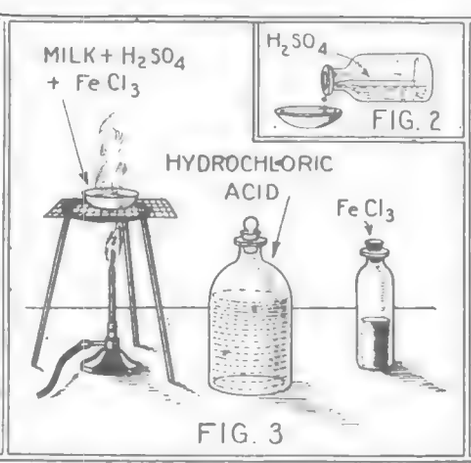


Fig. 2. Milk is evaporated and tested with acid for the presence of a bicarbonate.
Fig. 3. Formaline in the presence of ferric chloride in acid solution gives a violet color.

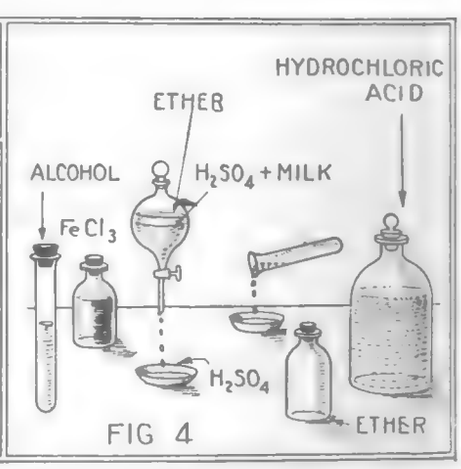


Fig. 4. Solid salicylic acid gives a similar color The milk is treated with alcohol and ferric chloride solution after being evaporated to dryness and shaken up with ether.

BORIC ACID

Evaporate a quantity of milk to dryness and incinerate the residue. Hydrochloric acid and water are then added and a strip of turmeric paper is immersed in the solution. The paper is then dried at 100° C. on a watch glass. If the tumeric paper is colored reddish brown, boracic acid is present. (See Fig. 1).

SODIUM BI-CARBONATE

Evaporate and incinerate another quantity of the milk to be tested and hydrochloric acid is added carefully to the residue. If the residue effervesces (gas given off) there are probably bi-carbonates present. (See Fig. 2.)

FORMALIN

Formalin is by far the most dangerous of the preservatives as it attacks the system especially of children.

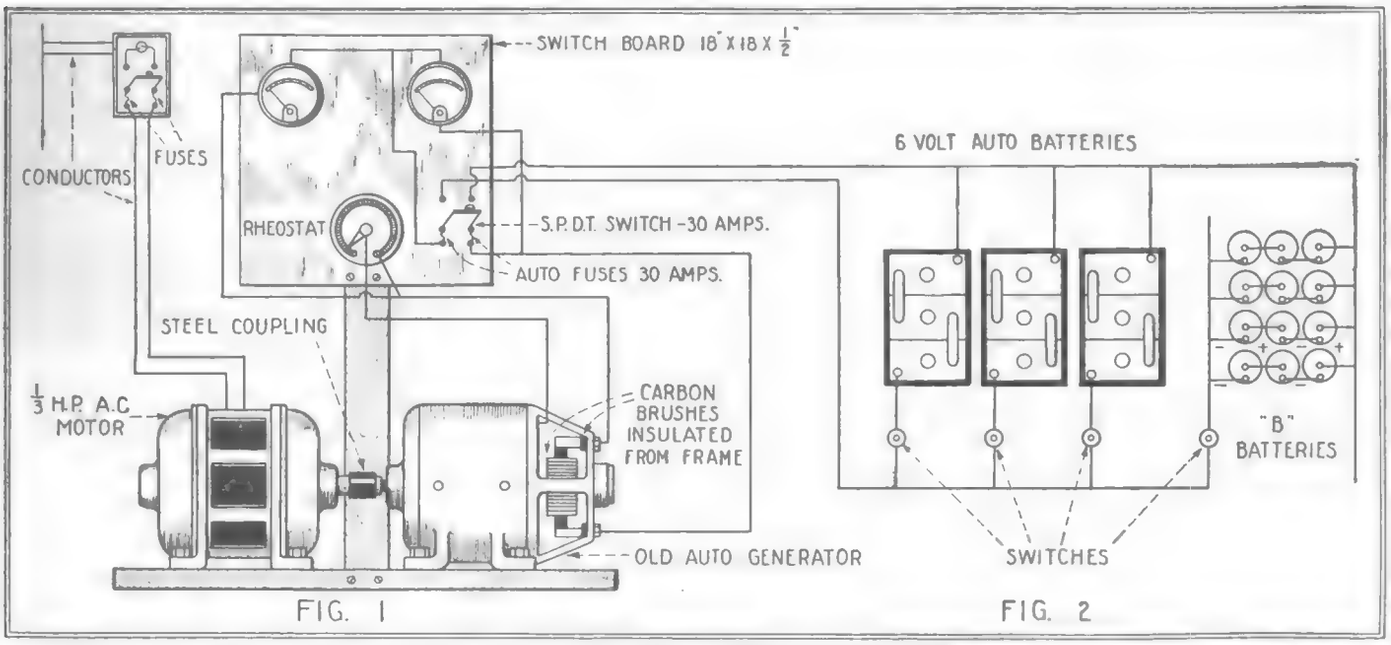
The milk (about 50 cc.) is boiled with a solution of concentrated hydrochloric acid and a trace of iron chloride when the milk will turn a violet color if formalin is present. (See Fig. 3).

SALICYLIC ACID

20 cc. of milk are acidulated with sulphuric acid and shaken with ether; the ether solution is evaporated to dryness, and the residue is treated with alcohol and a little iron chloride solution, a deep violet color will be given by salicylic acid. (See Fig. 4).

A Motor-Generator Battery Charger

By WILLIS L. JONES



The mounting arrangement and panel construction of the motor-generator battery charger is shown above. A 1/3 horse-power alternating current motor is coupled to a salvaged automobile generator. With this arrangement several six-volt batteries may be charged at the same time.

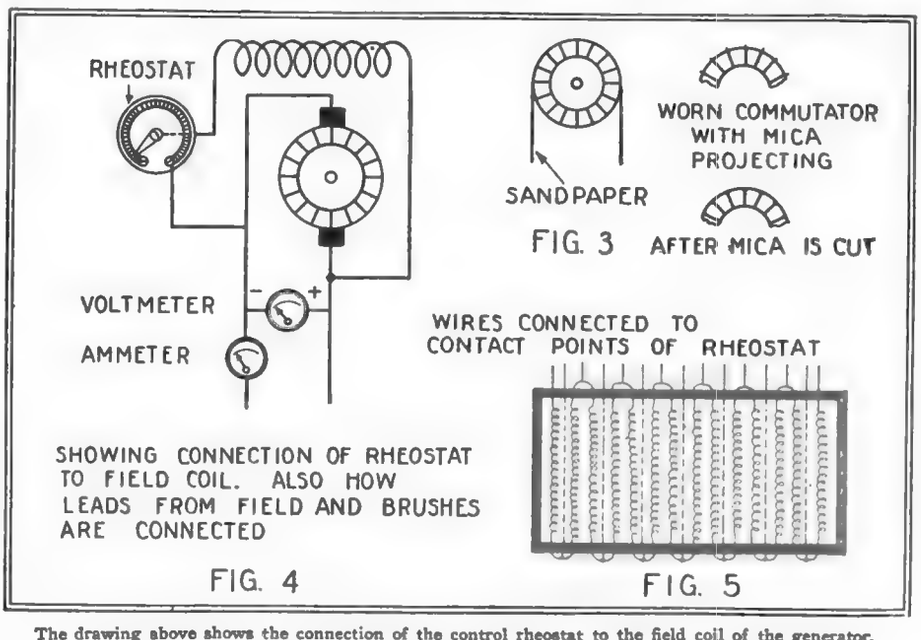
THERE is nothing like a battery charger using a D.C. generator. No contact points to wear out; no expensive bulbs to burn out. Just a snap of a switch and this charger that I am about to describe, will hum away developing from 200 to 240 watts.

The generator used for this outfit was purchased from an "automobile graveyard"; every city of any size has one. Any kind of generator will do, but I find from past experiences of making several such apparatus, that the old style Delcos are more reliable, and will develop 30 amperes without overheating. That is provided it is in fair condition and not wet or oil-soaked from lying in or near water or oil. Before purchasing it, with one cell of dry battery or a regular 6-volt storage battery, test for shorts in the armature and field coils.

Connect one pole of the battery to the end of one field coil and touch the wire from the other pole to the generator frame. If there is a spark there is a short in the field coils, and the generator should be discarded, as field coils are very expensive to wire. If there is no spark and a slight magentism is felt (ascertained by holding nail near field pole besting tested) the fields are O. K.

Next try the armature. Connect one pole of the battery to one segment of the commutator and touch the other pole of the battery to the shaft of the armature. If there is a short it will spark. Whether or not it should be discarded is up to the builder of the outfit, as the armature can be rewound by nearly any motor electrician, the cost being between $5.00 to $8.00. The writer found that nearly all of these places or "grave yards" have plenty of used generators and there is no need to take a defective one, because for about $10.00 an excellent one can be obtained. The writer has bought about 11 so far and $10.00 is the highest price he has paid yet, the general prices were in the neighborhood of $5.00 to $6.00. Now disconnect the pole from the shaft and leaving the one pole on the segment of the commutator as before proceed to try out each segment to see that there are no loose connections. There should be a spark as each segment is touched; if there is none, then that segment is disconnected from the armature windings and should be resoldered to it. If there are no shorts or loose connections, and the insulation intact, that is none of the covering off the wires, and if the generator is dry, which is a big factor, as water is a conductor of electricity, it can be called in good condition. The writer takes for granted that the mechanical condition is O. K. If the generator is of the 12-volt type two of the regular 6-volt batteries must be charged in series. The B batteries must be connected 6 cells in series instead of 3.

Fig. I on page IX shows the generator



The drawing above shows the connection of the control rheostat to the field coil of the generator. The method of cleaning a worn commutator with sandpaper is also illustrated.

coupled to a ⅓-H.P. 60-Cyc., single phase A.C., 110-volt motor. A piece of iron pipe is reamed out to fit the shafts. Two ¼-in. holes are drilled through the pipe and the shaft. Wire nails are then driven through and bent.

The base for the outfit is made from heavy wood about 36 inches long 8 inches wide and between 1½ to 2 inches thick.

The switchboard for the generator is 18 inches long 12 inches wide and ½ inch thick. It is bolted to the base with 9-inch bolts ½ inch in diameter as per diagram. For this switchboard wood may be used as it is inexpensive, and there is no danger from fire, as this is a low voltage affair.

The switch is double-pole, single-throw, with a capacity of 30 amps. or over.

The ammeter and the voltmeter are used ones and costs approximately $1.00 each. The ammeter registers from 1 to 30 amperes. The voltmeter from 1 to 14 volts.

The fuses are for 30 amperes maximum capacity. They protect the generator from short circuit.

The contact points for the rheostat are made from heavy thumb tacks; the contact lever from a piece of scrap copper. The resistance wire consists of single strands of picture wire. They are made in coils ¼ inch in diameter and about 8 inches long. There are 3 feet in each coil. Each coil is attached to a small copper wire (see Fig. 8) and they are connected to the contact points of the rheostat. It is then placed in series with the field coils of the generator. (See Fig. 6).

If the commutator of the generator is rough or if the mica is projecting, sandpaper or cut it as shown in the illustrations.

Fig. 2 shows the method used in charging the batteries.

If only one battery is to be charged, and the operator wants to charge it at a 5- to 10-ampere rate, by moving the handle of the generator rheostat located on the switchboard any desired output may be had. The least resistance in the path of the field coils the more current at the brushes and vice-versa.

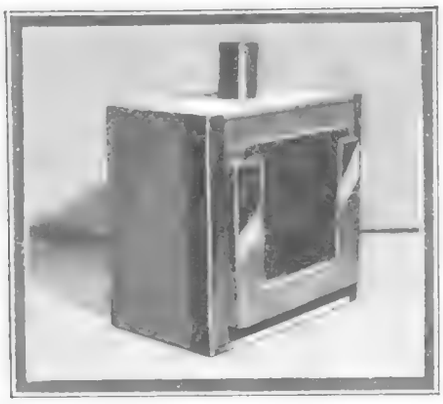
While the batteries are charging be sure to remove the vent covers. Also do not spark the batteries or have lighted matches around while they are charging as there is danger of an explosion.

Also the more batteries charged at one time the cheaper. That is by charging about 5 at one time we take advantage of the full power of the prime mover if it be an electric motor.

If the builder does not want to charge more than one or two batteries at one time, then it is best to use a ¼- or 1/6-H.P. motor.

A Filter For Near Ultra-Violet Rays

By RAYMOND B. WAILES



The exterior of the near ultra-violet ray filter box is shown above. It will be seen that the glass slide is tightly fitted into metal grooves which prevent the leakage of any extraneous rays into the box. The opening at the top holds an eye-piece for observation of the contents of the box in action.

MANY experimenters who have derived hours of instruction and amusement in their little shops or laboratories with phosphorescent or luminous substances know that the compounds experimented with become luminous only when exposed to a source of light, and that the fluorescence is very difficult to see because of the luminosity of the source of light. By using a glass which screens out the visible light and allows the near ultra-violet light to pass, one may continue the study of luminous bodies and the effects of ultra-violet light over a wider field than without using such a filter.

The filter describes here is made from a wooden box about ten inches square and is fitted with a square of glass known as G586AW which costs about two dollars.

This glass is transparent only to the rays of about 363 mu, that is, about the range of the near ultra violet rays. It keeps back all of the visible or "light" rays; so a lamp placed back of it cannot be seen. As the effects of fluorescence and phosphorescence are due in the main to ultra violet rays, this glass serves admirably for many interesting experiments.

The glass as sold is about 6½" square. It should be fitted in a sheet metal holder upon the front of the wooden box, so that the metal overlaps the glass for about an inch, thereby making a light-tight fit. A strip of felt or flannel can be glued to the inside runners, making it doubly sure of being light-tight. As can be seen from the pictures, the lid of the box slides into a metal strip which serves to keep the visible light from the interior of the box. A cardboard carton or tube is fitted into a hole in the top of the box so that the observer may look into the interior in which the different substances are placed, and note the effect produced by the light or source of rays located on the outside of the box. A half inch hole is large enough for this purpose.

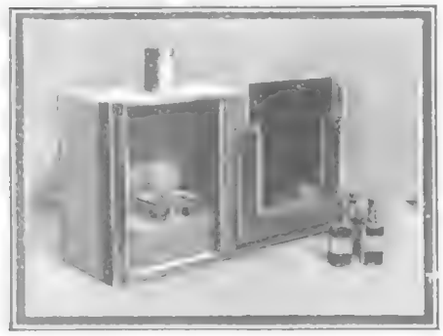
One of the most common sources of ultra violet rays is the electric arc lamp. If this be set up in operation in front, and if desired, some distance from the filter glass front of the box, and a solution of a two grain quinine capsule dissolved in a bit of acidulated water (which can be taken from a storage battery) is placed in a small bottle inside of the filter box, an intense blue fluorescence can be seen coming from the solution if viewed from the hole above. On cutting off the arc, the fluorescence ceases. An electric iron can be connected in series with the arc lamp for resistance. Beautiful fluorescences were obtained by the writer with an arc passing 10.8 amperes and having a voltage drop of 27 volts across it.

Other substances can be used instead of quinine salts. Cp.P. sublimed anthracene coated upon a sheet of paper with a mucilage solution will glow when placed in the box and exposed to the radiations coming through the filter glass from an electric arc. A water solution of aesculin or the solutions obtained from the sticky buds from a horse chestnut tree, soaked in water, gives a blue fluorescence. Eosin, erythrosine (aniline red) in water solution give a blue fluorescene. Fluorescein in a dilute caustic solution glows beautifully. Glass or cardboard coated with luminous zinc sulphide without any radium salt admixture also glows.

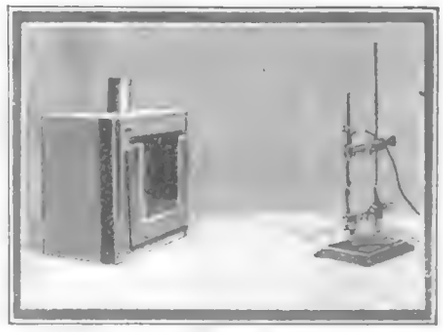
Holding the hand between the arc and the luminous object will cause a shadow of the hand to be cast upon the luminous body, because the rays do not pass through the hand. If anthracene or phosphorescent zinc sulphide is coated upon a card and inserted in the box at an angle, the entire shadow of the hand can be distinctly seen when viewed through the hole. If the hand be withdrawn, the shadow will gradually fade out, because the substance has a lag in its luminous effect.

The filter box can also be used in experimenting with selenium cells. The cell can be inserted in the box and connected with its battery and indicating instrument and exposed to the ultra-violet rays coming through the glass from the source.

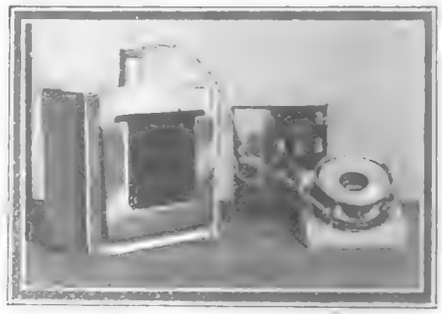
The box can also be used for determining the ultra-violet productive effect of different lamps and sources of light. Soaking the arc carbons in solutions of uranium salts increase the ultra-violet intensity of the arc formed in which they are used.



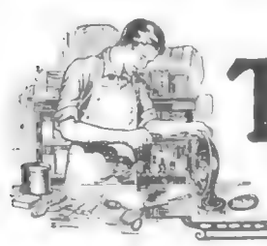
Substances to be tested for phosphorescence or luminescence are placed upon the stage shown just back of the sliding door. The filter box may also be used in experimenting with selenium cells, and to test the ultra-violet content of light from different sources under various conditions.



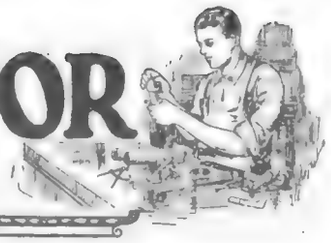
An arc light emits a considerable percentage of ultra-violet rays, hence it may be used in all the experiments spoken of in this article. The photograph above shows the proper position of the arc light relative to the filter box. It is possible to work with greater separation.



The apparatus may be arranged as shown when it is desired to test photo-electric or selenium cells under the action of ultra-violet rays. It should be carefully ascertained that no light whatever be permitted to leak through the seals into the filter box.



THE CONSTRUCTOR



Deaf-Phone and 2-Stage Amplifier

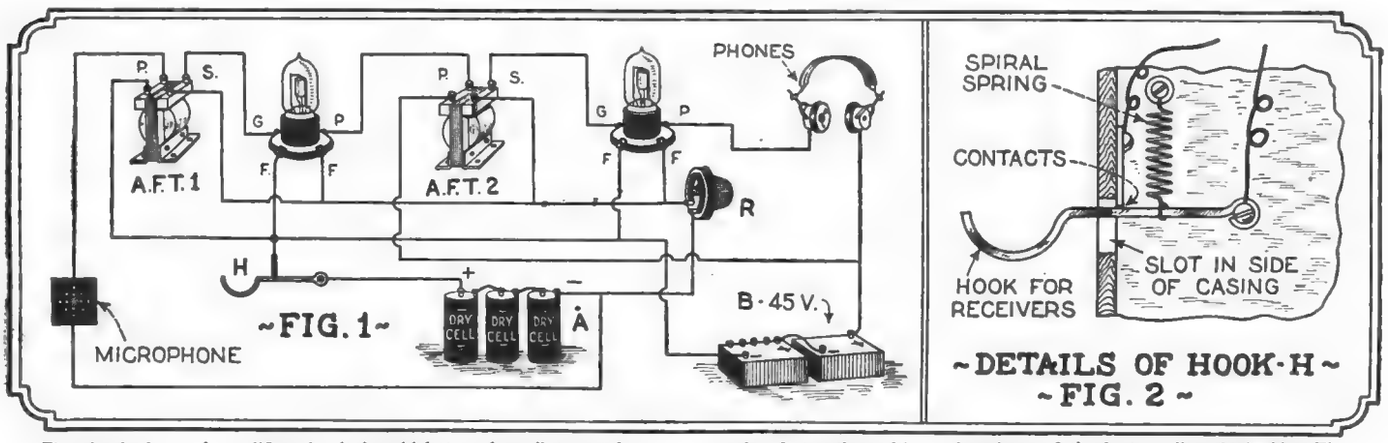
By A. P. PECK

FOR the person that is really hard of hearing, the average microphone, battery and sensitive receiver combination that now sold as a *deaf-phone*, is of little if any value. True enough, it is entirely portable and very handy in this respect, but of what value is it if it does not help its user? The writer was recently approached by a doctor who is very hard of hearing and who has extreme difficulty in communicating with his patients. He could hear sounds that were very loud and distinct, but the ordinary deaf-phone such as mentioned above, was of no help to him. He owned one of these combinations, and asked if it would not be possible to improve it in some way so that he could use it. He did not care particularly whether the apparatus was entirely portable, because it would be used at practically all times on his office desk.

The deaf-phone here illustrated and described by the author is shown in actual use in the accompanying photo. It may be used as a dictagraph.

The writer, therefore, set about designing such an instrument, using a principle that is well known to radio users—that of audio-frequency amplification by means of vacuum tubes. The results from the finished apparatus were so good that we are quite sure that a good many readers of this magazine will be interested in the construction of the apparatus for their own purposes. The finished instrument is small and compact, and while it can hardlly be carried around for use at all times, still it serves its own purpose very well. Such an instrument would be of great value to all afflicted with partial deafness, and its construction is so simple that even a man who is only slightly handy with tools should have no trouble in constructing it.

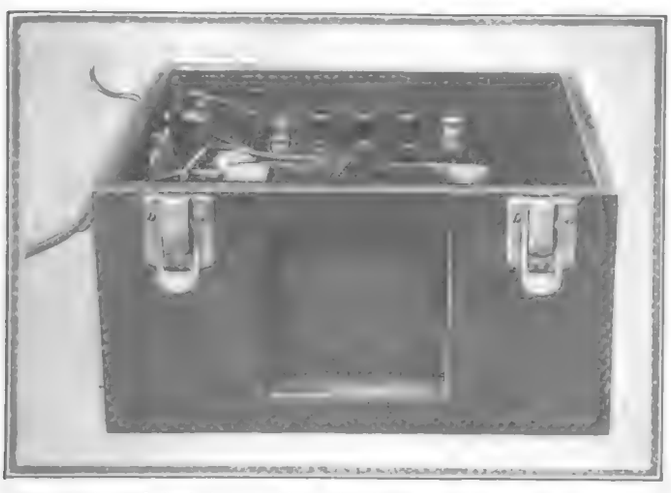
The doctor gave the writer his portable so-called *deaf-phone*, and the microphone incorporated in it was used as the pick-up medium in the new instrument. A small cabinet such as is used for portable radio sets was obtained, and a hole was cut in the front to accommodate the pick-up unit, and was so constructed that the microphone could be slipped into place and would be held there firmly. Back of this compartment an ordinary two-stage audio-frequency amplifier was laid out and wired up. The complete circuit diagram used is shown in Fig. 1. As will be seen, the "A" battery which supplies the filament circuit for the tubes is also in the microphone circuit and supplies the current for it.



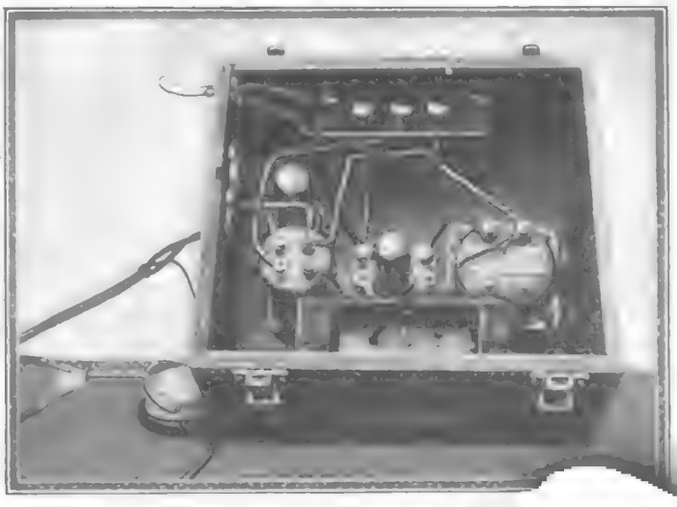
The simple form of amplifier circuit in which two dry-cell type tubes are used, is illustrated above. Two ordinary audio frequency transformers are employed, together with a microphone of the best quality obtainable. The filament circuit is opened by the hook switch "H".

A rather unique circuit breaker was used in this outfit, and was wired up as shown, so as to open both the filament circuit and the microphone circuit. It consists merely

(*Continued on page* 559)



Front view of deaf-phone cabinet showing terminal posts and arrangement of microphone behind perforated grill. The weight is not excessive.



Top view of deaf-phone cabinet with lid removed. This uum tubes as well as two audio frequency amplifyin

Simple High Temperature Furnaces

By WILLIAM CAPUNE

SAD to say, the fascinating realm of high temperature work has been closed, for the most part, to the average experimenter, and needlessly. There is a certain romance in fusing solid metals in a little furnace and bringing forth a substance so hard that files make no appreciable impression on it, or a metal that melts when dropped into a cup of hot water! To be sure, a few hardy fellows have tried the electric arc for the production of high heat, but nearly all lighting circuits are designed for a much smaller load than the steady running of an arc requires: even with heavy resistances in the circuit the household lights dim very noticeably when the electrodes of the arc are brought together, recovering only a part of their former strength when the initial load has passed.

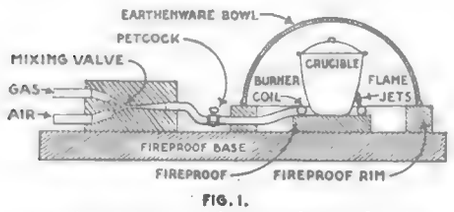


FIG. 1.
A high temperature laboratory furnace burning a mixture of gas and air.

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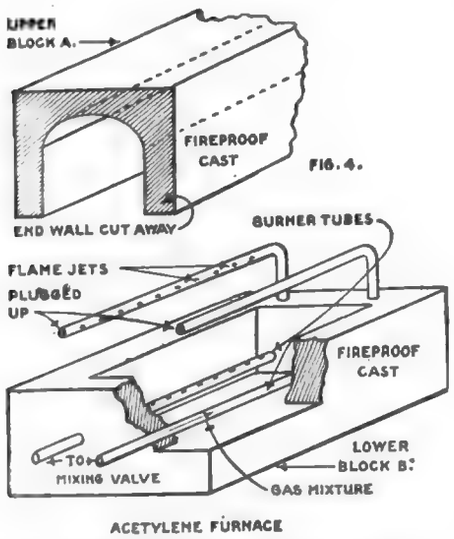
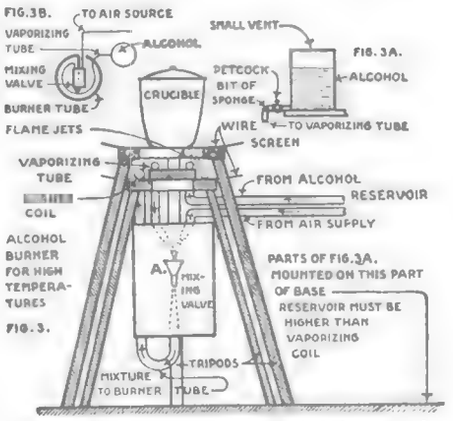
The base can be of asbestos, brick, fireclay, or anything else unburnable. The central block is of the same material. The roof of the furnace is an ordinary earthenware mixing bowl, supported by a small rim. The rim may be of the same material as the base. Clay has the advantage in this case that it may be readily drilled for the passage of the gas tube.

In all the places where a fire-resistant material is needed the writer has found that a mixture of ordinary Portland cement and fine sand, about one part of cement to six or seven of sand, makes an excellent job, and can be cast, holes and all, in shellacked cardboard molds to exactly the desired shape. Many of the patented "water putties" on the market are also good; the kind that set permanently when once dry. Soft, red building brick is an excellent material and may be worked with cold chisels and files with very little labor. For tubing, copper or brass is the best, being relatively inexpensive and easily worked. Rubber tubing may be used wherever it is not exposed to heat.



ACETYLENE FURNACE
A simply constructed furnace for burning acetylene gas and generating high temperature.



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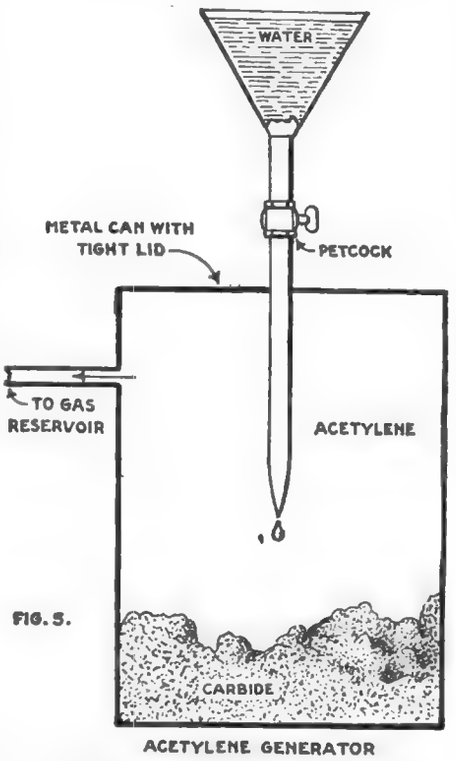

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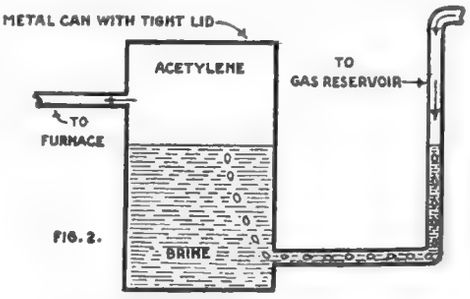

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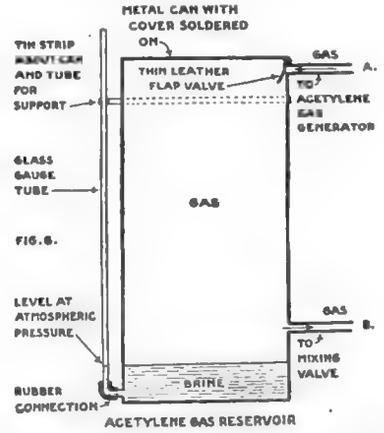

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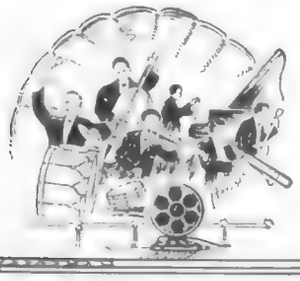
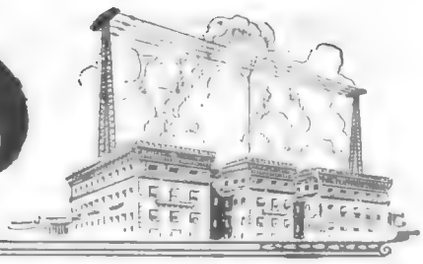


RADIO



Fonck's Plane Radio Equipped

Lieut. A. P. Snody, Dr. M. Lionel Stein and Capt. Rene Fonck are shown examining the radio equipment recently forwarded from France for use on the transatlantic flight. At left is the wind-driven generator, in the center the four tube receiver and at the right the 150-watt transmitter. Capt. Fonck is holding the reel upon which the antenna is wound.

Charles Clavier, who came all the way from France to install the equipment on the Fonck plane, is shown testing the 150-watt transmitter. Constant communication with land will be maintained by radio and it will be used to obtain bearings and to hold to the outlined course of the flight. In case of accident, the radio may prevent the chances of tragedy.

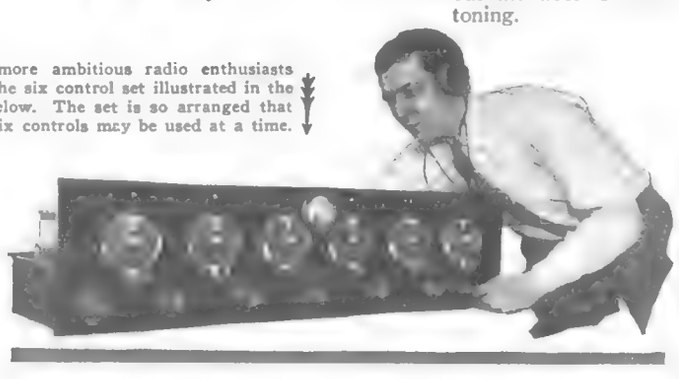
NO one connected with the proposed flight from New York to Paris, which is scheduled for September 1, has made the mistake of underestimating the importance of radio in the undertaking. The entire equipment was made in France; it is somewhat elaborate, but compact and efficient. The receiver is standard, but the transmitter is of particular interest. Three 50-watt tubes are used and the wavelength may be changed by inserting small telephone plugs into jacks to vary the inductance, covering a range of 300 to 2000 meters Although short waves are more efficient, the metal of airplanes absorbs most of the radiated energy at high frequencies.

Radio Aids Farmer

IT is reported that a truck farmer in New Jersey fitted up a wheel barrow with a complete radio set and carted it around with him as he went about his daily tasks. He found that the programs brought to him by the radio did much to lighten his toil through their psychological effect. This brings to mind the story of the farmer who tried the psychic effect of music on his cows. He put a phonograph in the barn at milking time to soothe the bovine spirit. One day the hired man put on a blues record by mistake and the day's production turned out to be buttermilk. A "hot" record was put on next and they wore out the floor Charlestoning.

The builder of this super-set is shown above comparing one of his first pre-war loose couplers with the latest thing out.

One of the more ambitious radio enthusiasts has built up the six control set illustrated in the two photos below. The set is so arranged that from one to six controls may be used at a time.



Front view of the set shown above will give an idea of the numerous controls which make this tuned radio frequency set a novelty.

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By WILLIAM CAPUNE

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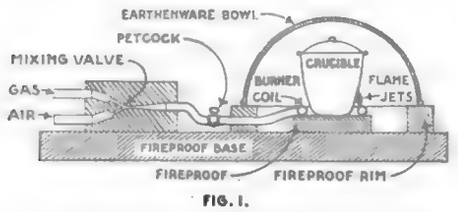

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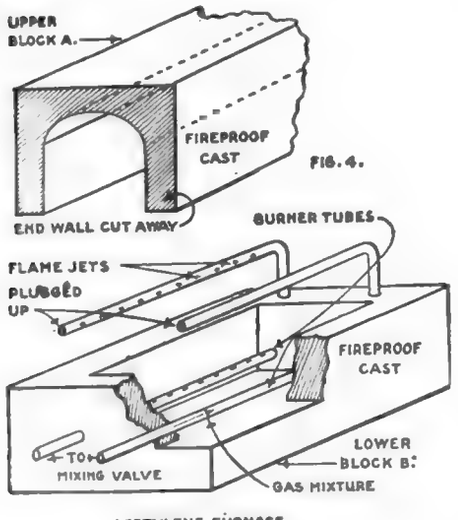

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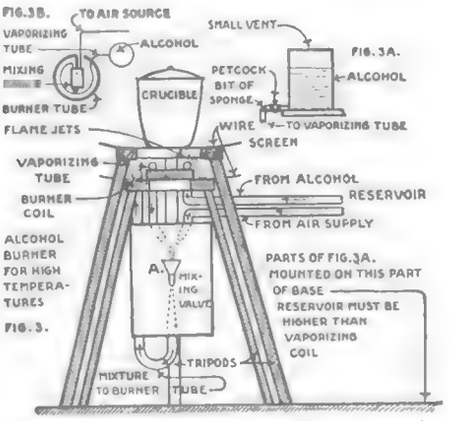

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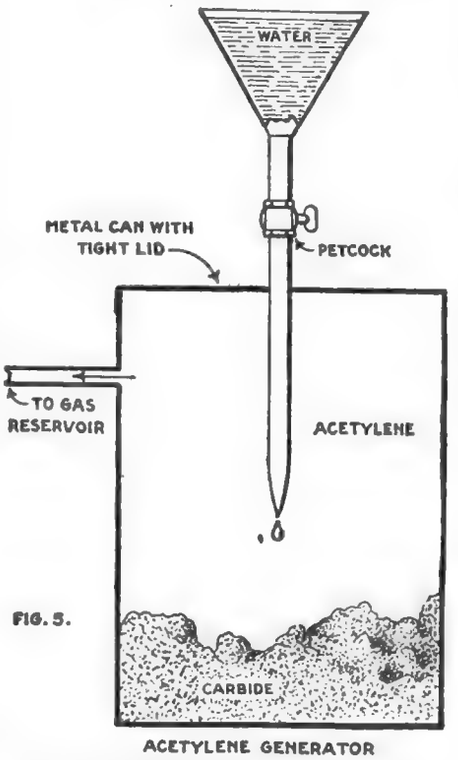

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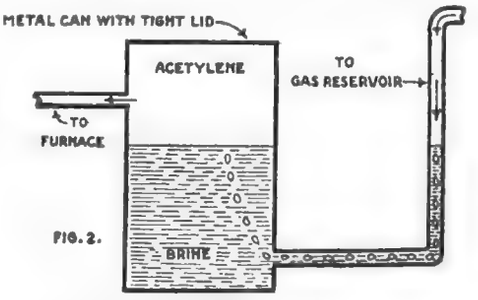

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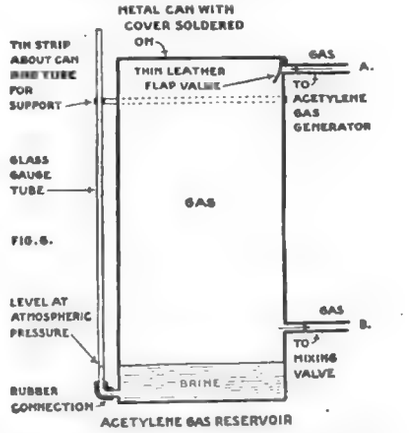

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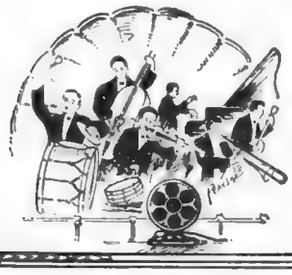

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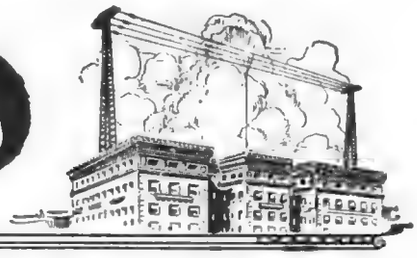


Fonck's Plane Radio Equipped

Lieut. A. P. Snody, Dr. M. Lionel Stein and Capt. Rene Fonck are shown examining the radio equipment recently forwarded from France for use on the transatlantic flight. At left is the wind-driven generator, in the center the four tube receiver and at the right the 150-watt transmitter. Capt. Fonck is holding the reel upon which the antenna is wound.

Charles Clavier, who came all the way from France to install the equipment on the Fonck plane, is shown testing the 150-watt transmitter. Constant communication with land will be maintained by radio and it will be used to obtain bearings and to hold to the outlined course of the flight. In case of accident, the radio may prevent the chances of tragedy.

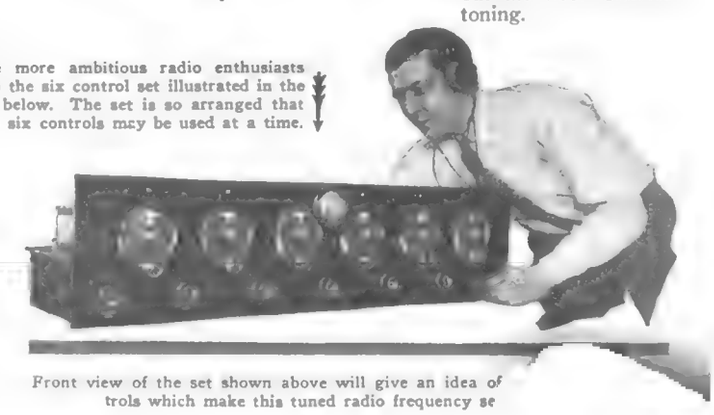
NO one connected with the proposed flight from New York to Paris, which is scheduled for September 1, has made the mistake of underestimating the importance of radio in the undertaking. The entire equipment was made in France; it is somewhat elaborate, but compact and efficient. The receiver is standard, but the transmitter is of particular interest. Three 50-watt tubes are used and the wavelength may be changed by inserting small telephone plugs into jacks to vary the inductance, covering a range of 300 to 2000 meters Although short waves are more efficient, the metal of airplanes absorbs most of the radiated energy at high frequencies.

Radio Aids Farmer

IT is reported that a truck farmer in New Jersey fitted up a wheel barrow with a complete radio set and carted it around with him as he went about his daily tasks. He found that the programs brought to him by the radio did much to lighten his toil through their psychological effect. This brings to mind the story of the farmer who tried the psychic effect of music on his cows. He put a phonograph in the barn at milking time to soothe the bovine spirit. One day the hired man put on a blues record by mistake and the day's production turned out to be buttermilk. A "hot" record was put on next and they wore out the floor Charlestoning.

The builder of this super-set is shown above comparing one of his first pre-war loose couplers with the latest thing out.

One of the more ambitious radio enthusiasts has built up the six control set illustrated in the two photos below. The set is so arranged that from one to six controls may be used at a time.



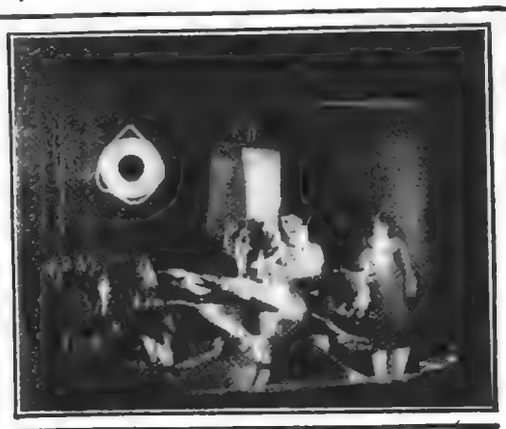
Front view of the set shown above will give an idea of trols which make this tuned radio frequency se

Likes and Dislikes of the Radio Audience

By CHARLES D. ISAACSON, Program Director,

Florence Lesher
One of WRNY's most charming songsters and frequent visitor.

Dick Hughes
Who, with his "uke," are regulars on WRNY programs.



ON THE BEACH AT WRNY
Starlight Park bathers, with Comtesse Du Barry, in a frolic.

MacDowell Sisters
Who hail from Texas, often heard in soothing, soft Hawaiian music at WRNY.

Sara Bair
A lovely and melodious interpreter of song from WRNY

Harold Dart
A brilliant pianist presented at WRNY by John Adam Hugo.

Percy Hemus
Great American baritone—an Edison Hour guest of WRNY

Madaleine Hunt
Star of the Radio Theatre Players who entertain you through WRNY

The 88. "Majestic" Scamps
Who provided a most enjoyable number when they went on the air recently over WRNY.

THE other day a most eccentric gentleman insisted that he be given the privileges of WRNY's microphone, and assured me that there would be a great deal of money in it for me, if I would let him speak just once. He would not tell me the character of the speech, because once it was told the secret was out. He did not mistrust me, but that was the situation. Further he could not write it—once he had been nearly killed for writing something.

Of course you will at once realize that the gentleman was suffering from a very definite mental aberration. But what he said was nevertheless interesting and useful. The way I was to receive the money was this: his first speech would announce the program for his further talks. Then I would be besieged by important people who would say to me "I will pay you so much for him to be allowed to speak," and others would come with "I will pay you so much if you will prevent him from making those speeches;" and the side who offered me the most would win—there would be millions in it for me.

(*Continued on page* 538)

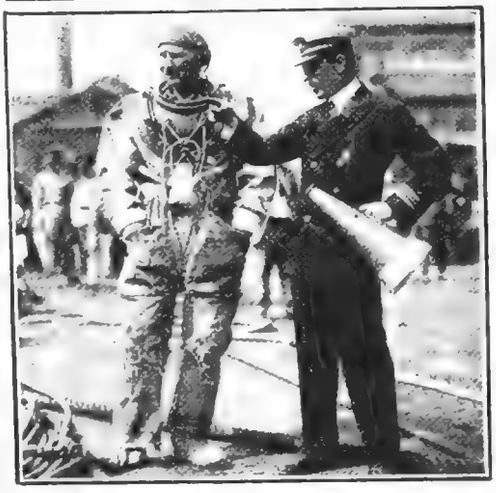
Maurice Schwartz
Of the Yiddish Art Theatre, as he appears out of costume at WRNY.

Helen Halprin
A most attractive pianiste, who graces WRNY programs.

Dr. Sigmund Spaeth
has returned with his artists to WRNY.

Xavier Cugat
Violinist - artist, sketches himself for WRNY fans.

Commander Edward Ellsberg
Who told over WRNY about the raising of the S-51, is shown with Diver Nelson.

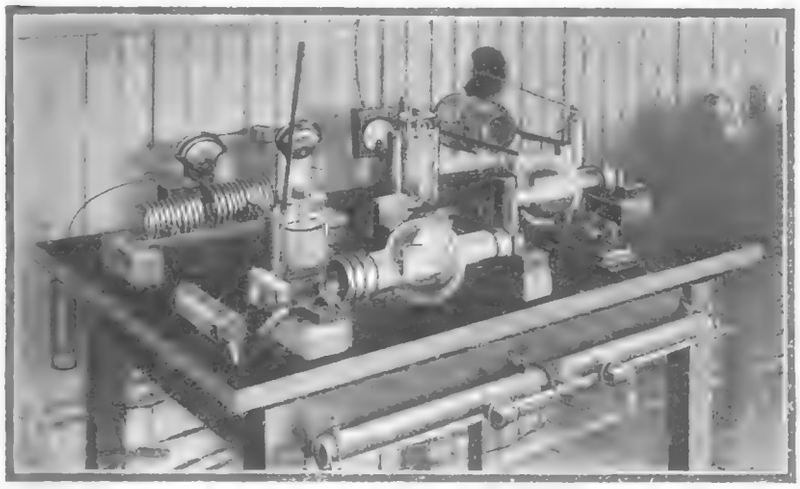


THE FIRST RADIO PRIZE FIGHT
Jimmie Rappaport and Bennie Martin in an event staged by Starlight Park at WRNY.

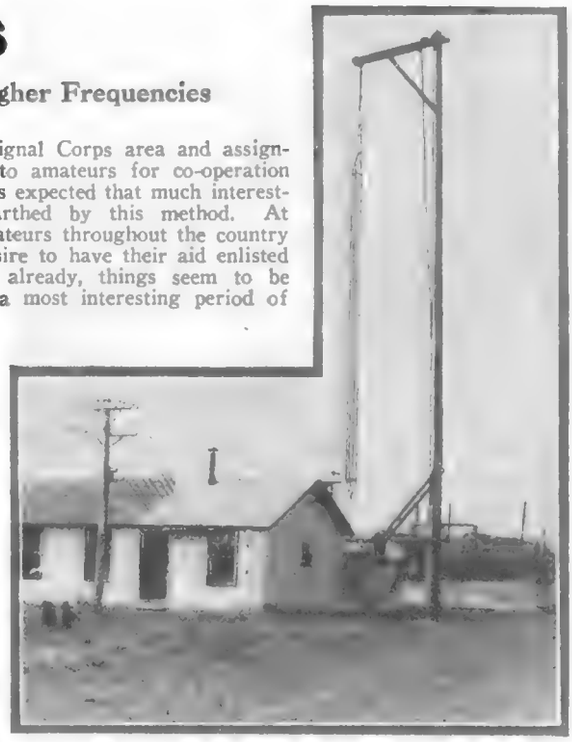
Below 100 Meters

What the U. S. Army and Amateurs Are Doing on the Higher Frequencies

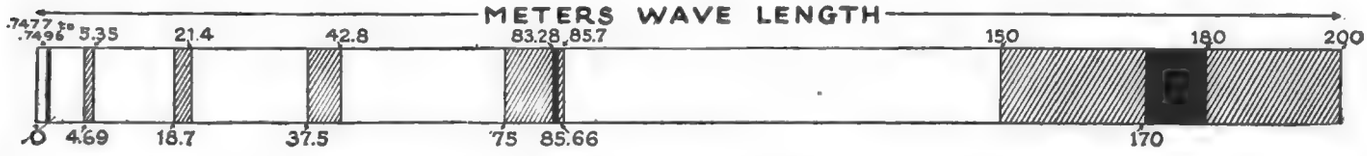
THE latest organization to be formed for the purpose of promoting the art of radio communication is that known as the Army-Amateur Radio Net. This is being promoted by an affiliation of the U. S. Army Signal Corps and the American Radio Relay League. The purpose is to conduct experimental and research work on the short waves, the Army having recognized the excellent work being accomplished by the amateurs using these wave-lengths. Army control stations have been situated in each Signal Corps area and assignments are being given to amateurs for co-operation with these stations. It is expected that much interesting data will be unearthed by this method. At the time of writing, amateurs throughout the country have expressed their desire to have their aid enlisted in this good work and already, things seem to be getting into shape for a most interesting period of radio work.



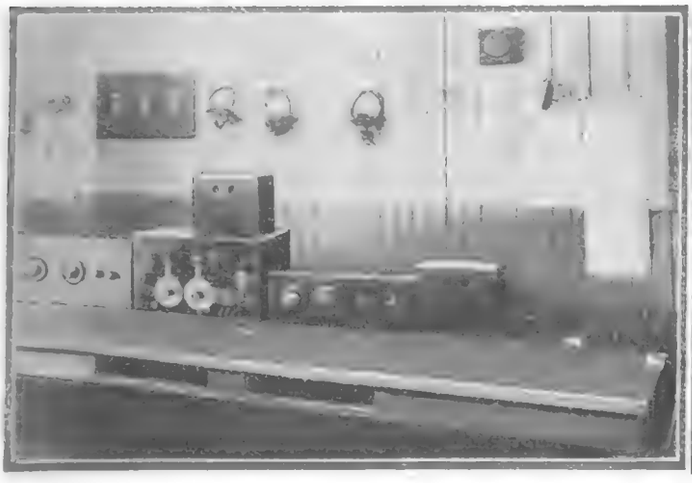
Short-wave station 2CXL is one of the foremost in the Army-Amateur Radio Net and the photograph directly above shows the master oscillator type of transmitter used at that station. This set has sent out signals that have been heard in practically all parts of the world. Its design is excellent. Note the accessibility of all parts as well as the neatness of wiring. The instruments are all arranged so that the shortest possible leads can be employed and the efficiency thus increased.



Above: The 65-foot mast at station 2CXL, the Army-Amateur control station of the second Signal Corps area at Fort Monmouth, N. J. A vertical antenna, one of the most efficient types possible to use for short-wave transmission is employed for operation on 40 meters. As can be seen, it consists of a multi-wire cage suspended directly above the operating room and so arranged that the lead-in will be short and direct. It would be well for transmitting amateurs interested in the higher frequencies to employ this type of aerial.



As shown in the chart, reproduced above, the amateurs of the United States are assigned to certain bands of wave-lengths ranging from .7477 to 200 meters. In our chart, the shaded portions indicate those bands devoted to code transmission. The solid black sections indicate spaces for radiophone work. Note the new small section of wave-lengths in the so-called 80-meter ham-band that is now available for phone communication. This band has but recently been assigned and if we are to keep it for our permanent use, we must keep within its limits. Straying over the edge in order to avoid QRM must be avoided. Try this new phone band—it is great stuff.



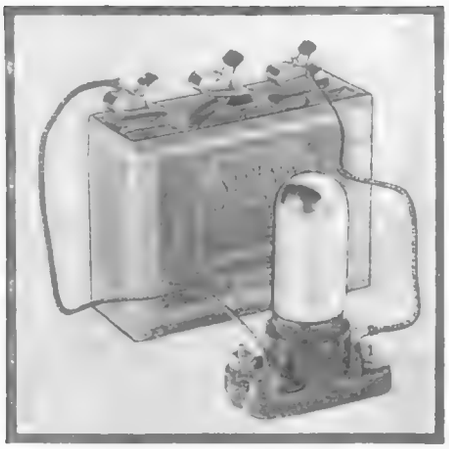
At 2CXL, of the Army-Amateur Radio Net, one of the neatest controlling layouts in existence is to be found. In the above illustration, the various receiving sets, amplifiers, control switches and keys are shown. Three standard types of receivers are noticeable toward the left-hand end of the table.

Above is an illustration of a typical amateur radio station. The transmitter is placed along the shelf shown to the left of the picture and directly below it are QSL or report cards from all p[illegible] world. This photo shows station 2APV with its opera[illegible] Jack Berliant. Station 2APV has been heard in

The Radio Fan's Own Page

Short-cuts And Kinks Make Experimenting Easier

By HERBERT E. HAYDEN



TUBE REJUVENATION

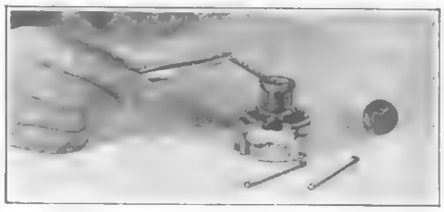
It often happens, particularly with the "199" type of tubes, that the filament voltage is advanced to a point where the tube paralyzes and refuses to continue operation. When this has been done, it is often possible to save the tube for further use by rejuvenating the filament. This can be accomplished by means of the standard type of manufactured rejuvenator or very often by means of the little stunt shown above. Here the filament of the tube is connected directly across a 3- or 4½-volt "C" battery and allowed to burn for a period of 15 minutes to three-quarters of an hour without any plate voltage being applied.

IMPROVING SOCKET CONTACTS

After a vacuum tube socket has been in use for a considerable period of time, the contact springs get bent out of shape and no longer make satisfactory contact with the prongs of the tube. It is inconvenient and difficult to reach into the socket with the fingers and bend the springs upward. Therefore, the little bent wire illustrated above can be used with very good effect. Hook it under the spring and pull gently but firmly upward until the spring has assumed its original shape. It is well to go over all of the sockets of your set periodically with a hook in order to keep the set operating at its greatest efficiency.

ENGRAVING FILLER

After engraving a scale or symbol on a panel, the grooves can be filled with ordinary toothpaste as shown above, giving a very unusual and pleasing effect. Be sure that the scratches are completely filled and then remove the surplus paste with a soft, damp cloth.



GRID LEAKS

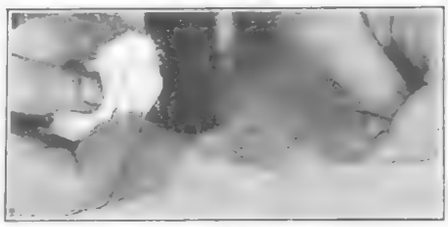
Experimental grid leaks or other resistances for various purposes can be made by dipping matchsticks or toothpicks into India ink, allowing them to soak for a few moments and then removing. To change the resistance, split the wood into various sized sections. Provide suitable mountings or connections.

BUSHING TIP

The bushings that are set into knobs or dials often come to the ultimate consumer with a small burr around the hole that prevents the indicator from being pushed upon a shaft. This burr can readily be removed by means of the point of a knife applied gently as shown in the photograph reproduced above. Insert the point and twist carefully until the burr is removed.

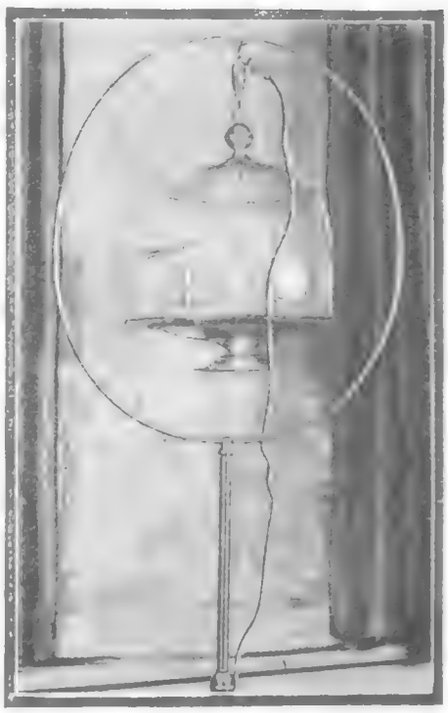
SOLDERING IRON REST

Did you ever scorch the surface of the dining room table by carelessly laying the hot soldering iron thereon? If you have, you know the disastrous results. Protect the table and in fact any other surface by keeping a small porcelain insulator of the type shown above at hand and placing the iron in one of the grooves when it is not in use.



CLEANING LITZ

Litzendraht wire or "Litz" as it is more frequently called, consists of a bundle of fine wire; each single wire is insulated from its neighbors by a coating of enamel. This enamel is exceptionally hard to remove from the small wires and disastrous results are frequently noted if it is attempted to remove this insulation by scraping. However, you need not worry any more about breaking the various strands and so rendering the wire less strong mechanically if you follow the system illustrated above. Saturate a piece of cloth with wood alcohol and after the external cable covering has been removed from the Litz, wipe the wires with this cloth and the enamel will come off.



BIRD CAGE AERIAL

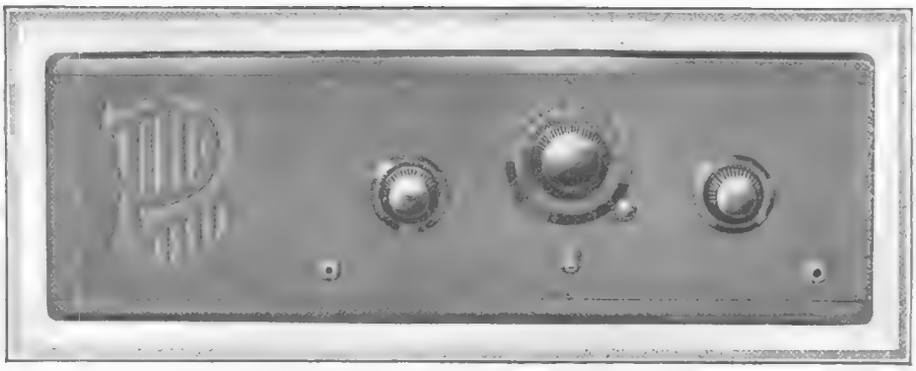
We have all heard of various kinds of freak aerials. Bed springs, window screens, and even dishpans have been pressed into service at various times to act as collective agencies for radio waves. Here is a new one. Fasten a clip to the end of a piece of flexible wire long enough to reach from your bird's domicile to the antenna binding post of your radio receiving set. Fasten the clip to any metallic part of the bird cage and presto—you have an aerial. This idea should suggest many other makeshift and freak aerials to the ingenious radio fan readers.

According to the nature and ways of the bird you may figure on various interesting results in the line of static. A parrot of energetic loquacity will enable you to dispense with a loud-speaker, while a canary will give solo performances rivalling real broadcast singing (sometimes).—EDITOR.

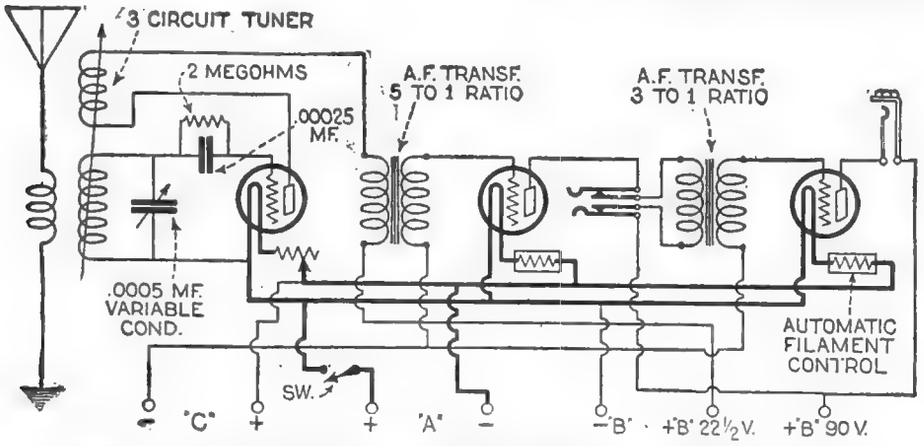
Monogram Receiver

By JOS. LIEBOWITZ

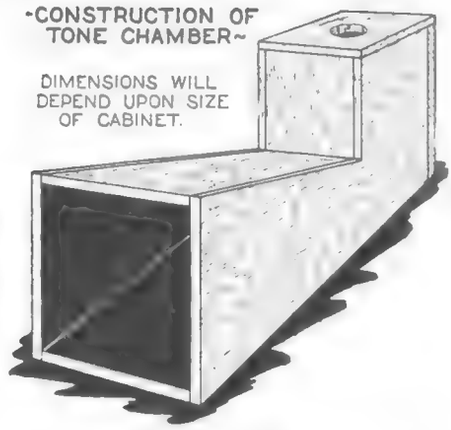
THIS novel radio set, of which a front view is shown at the right, shows a touch of personality in the grill work of the tone chamber. The opening in the panel at the left end of the set was cut in the shape of the letter "P", the initial of the owner, by careful use of a fret-saw. The circuit used is the standard regenerative, with an aperiodic primary, tickler plate circuit, and tuned secondary.



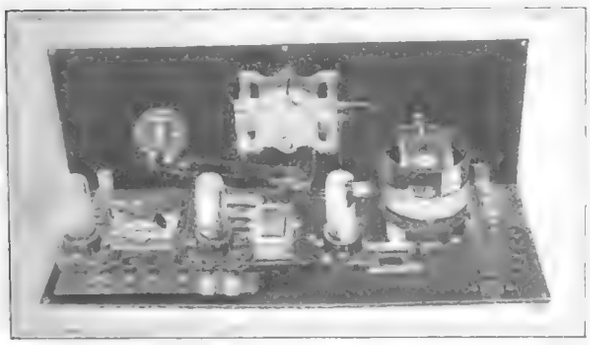
Above is seen the panel arrangement of the monogram radio. The jacks control the first and second stages of audio frequency, the first knob adjusts the plate coupling, the second controls the secondary variable condenser, and the third, the detector rheostat.



An inspection of the circuit diagram shown above reveals no novelties or trick features. The ever-popular three circuit tuner may be recognized, with condenser-tuned secondary and rotating tickler. Automatic filament control is provided for the amplifier tubes.



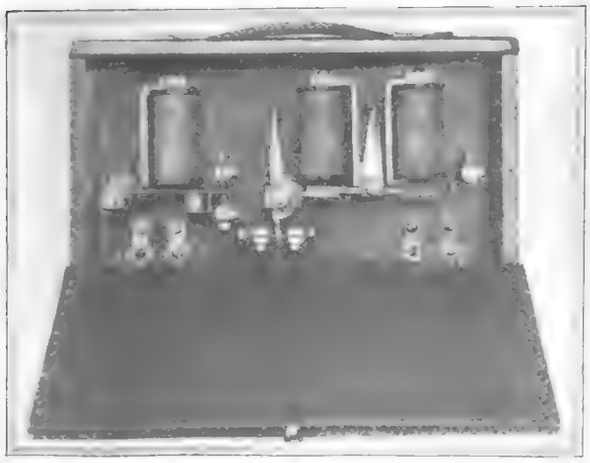
The tone chamber shown above may be constructed of three-ply wood veneer or, in case of necessity, of stiff paper or coardboard.



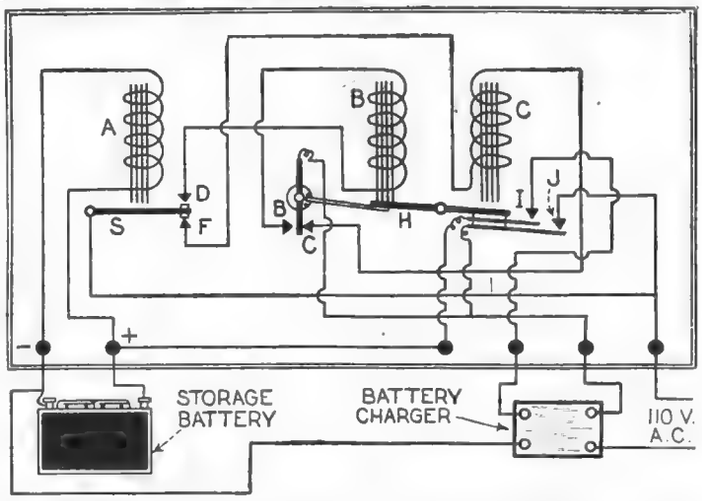
The arrangement of the apparatus may be seen in this photograph. Note that the transformer cores are at right angles. Be careful in wiring the set to keep the leads well apart, as your success in controlling regeneration depends on this.

In the upper left of the above photo is seen the loud speaker unit, mounted on top of the tone chamber. The leads to the row of binding posts on the strip at the rear of the cabinet are carried through holes in the back wall, and may be bunched outside the set proper.

An Automatic Battery Charging Regulator



The instrument above, diagram at right, automatically connects and disconnects the "A" battery from charger. A system of relays opens and closes the line-circuit of the charger.

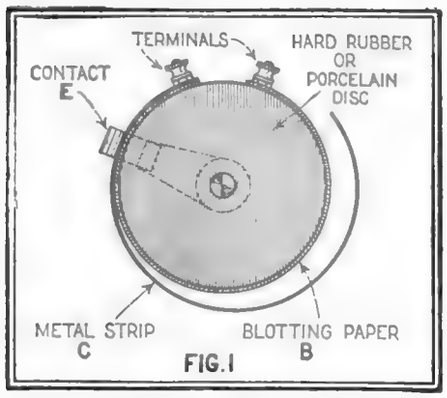


Drop in "A" battery voltage releases armature S, energizing coil C, and trips armature H to make contacts I and J. When voltage rises, S lifts, energizes coil B, trips H to break contacts I and J.

Variable High Ohm Resistances

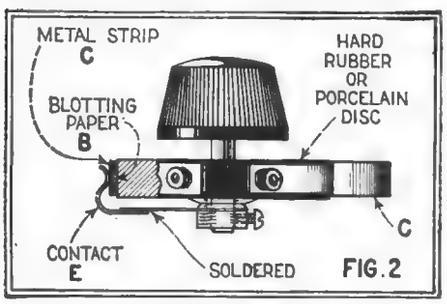
By OTTO SCHRIEBER, E.E., Austrian Radio Service

THE amateur who works with the usual resistance sold in stores, will often have had disappointments without being able to ascertain their cause, because, he will in all probability never think



Here we show an end view of a variable high resistance for use in a radio set.

of the resistance as the faulty piece or even if he does think of it, he will hardly ever be able to change it. In any case, with some hook-ups, he will have to build a variable re-



This shows more details of the type of resistance illustrated in Fig. 1 above.

sistance. The following tips will undoubtedly help.

In making a variable resistance it must be remembered that the regulation should not take place by dragging a metal contact on the resistance material, but by touching it and lifting it off again. For even one passage over the resistance body will leave a track, which may change its value by hundreds or thousands of ohms.

One good method is to take an old resistance unit, remove the wire and replace it by a strip of heavy blotting paper which has been saturated with India ink (Fig. 1). One screw is used to fasten the blotting paper together (Fig. 1b) with a thin strip of brass, copper, or tin, (Fig. 1c) to the hard rubber or porcelain disk. This metal strip must be long enough to surround the entire paper strip, and serves to produce a constant variation in resistance by being pressed against it at various points. The pressure is exerted by a piece of stronger spring metal (Fig. 2)

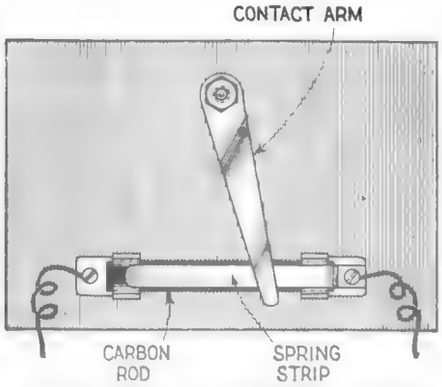


Fig. 3. Another type of variable high resistance uses a carbon rod as the resistor.

which is soldered to the old friction contact of the resistance unit, so that variations can be easily obtained by turning the knob. Connections are made at the two screws.

Fig. 3 shows the use of a high resistance rod such as carbon for a variable resistance. Here an ordinary rod holder is fastened to a hard rubber, bakelite, radion or celeron base, care being taken that the springs, which hold the rod, do not extend beyond its top, and that the latter is free the full length of its surface. At the contact point (C) a thin brass spring is soldered. It is long enough to cover the entire length of the resistance rod, when pressed against it.

The method of operation is as follows: If the spring is pressed against the rod in the

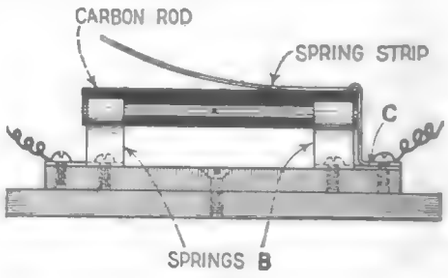
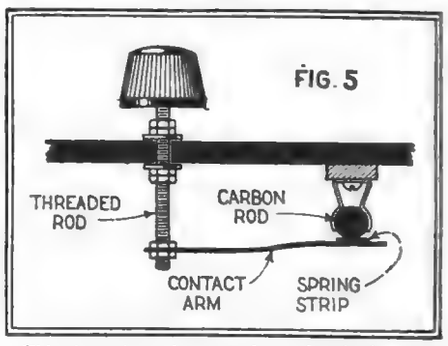


FIG. 3

The side view of the carbon rod resistor unit shows more constructional details.

center of the latter, only one half of the resistance is brought into play, as the current will pass from the center by the easiest path through the spring to the contact point, rather than pass through the covered half of the rod.

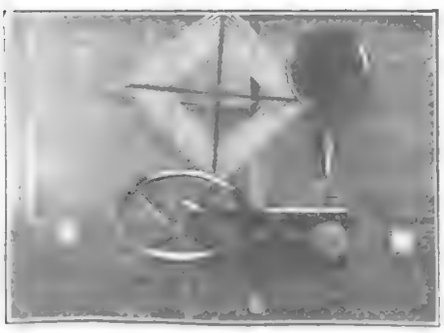
Figs. 4 and 5 show the mounting of the



This shows how the control arm for the instrument shown in Fig. 3 is mounted.

contact and its axle. A long screw spindle may be used as shaft if washers and lock nuts are used on each side of the panel.

Radio Sets for the Traveler



The above photograph shows a Super-Heterodyne type of receiver mounted in a specially designed automobile which the owner uses for camping. The top folds so that it can be taken out and set away when traveling.

Ingersoll, courtesy General Electric Co.

RADIO receiving sets have become so much a part of our daily life that many of us are loathe to leave them behind when we have to travel for either business or pleasure. The photographs at the left and right show what two resourceful radio bugs have done, in order to have their favorite sets with them at all times. One motor camper has mounted his set in the front of his camp car where it is always available for use. A traveling photographer has made up a special carrying case in which he keeps his camera and his set. The set uses dry cell tubes and is self-contained.

Here we see the photographer's combination. The phones are kept in the cover, the camera is in the left-hand end of the case and to the right of it, a complete radio set is built.

List of Broadcast Stations in the United States

Radio Call Letter	BROADCAST STA. Location	Wave (Meters)	Power (Watts)
KDKA,	East Pittsburgh, Pa.	309.1	Var.
KDLR,	Devils Lake, N. D.	231	5
KDYL,	Salt Lake City, Utah	246	50
KFAB,	Lincoln, Neb.	340.7	1000
KFAD,	Phoenix, Ariz.	273	100
KFAF,	San Jose, Calif.	217.3	50
KFAU,	Boise, Idaho	280.2	750
KFBB,	Havre, Mont.	275	50
KFBC,	San Diego, Calif.	215.7	50
KFBK,	Sacramento, Calif.	248	100
KFBL,	Everett, Wash.	224	100
KFBS,	Trinidad, Colo.	238	15
KFBU,	Laramie, Wyo.	375	500
KFCB,	Phoenix, Ariz.	238	100
KFDD,	Boise, Idaho	275.1	50
KFDM,	Beaumont, Tex.	315.6	500
KFDX,	Shreveport, La.	250	100
KFDY,	Brookings, S. Dak.	273	100
KFDZ,	Minneapolis, Minn.	231	10
KFEC,	Portland, Ore.	248	50
KFEL,	Denver, Colo.	254	250
KFEQ,	Oak, Nebr.	268	500
KFEY,	Kellogg, Idaho	233	10
KFFP,	Moberly, Mo.	242	50
KFGQ,	Boone, Iowa	226	10
KFH,	Wichita, Kans.	268	500
KFHA,	Gunnison, Colo.	252	50
KFHL,	Oskaloosa, Iowa	240	10
KFI,	Los Angeles, Calif.	467	5000
KFIF,	Portland, Ore.	248	100
KFIO,	Spokane, Washington	273	500
KFIQ,	Yakima, Wash.	256	500
KFIU,	Juneau, Alaska	226	10
KFIZ,	Fond du Lac, Wis.	273	100
KFJB,	Marshalltown, Iowa	248	10
KFJC,	Junction City, Kansas	218.8	10
KFJF,	Oklahoma City, Okla.	261	500
KFJI,	Astoria, Ore.	246	10
KFJM,	Grand Forks, N. Dak.	278	100
KFJR,	Portland, Ore.	263	120
KFJY,	Fort Dodge, Iowa	248	50
KFJZ,	Fort Worth, Tex.	254	50
KFKA,	Greeley, Colo.	273	50
KFKU,	Lawrence, Kans.	275	500
KFKX,	Hastings, Nebr.	288.3	5000
KFKZ,	Kirksville, Mo.	225.4	50
KFLR,	Albuquerque, N. Mex.	254	100
KFLU,	San Benito, Tex.	236	20
KFLV,	Rockford, Ill.	229	100
KFLX,	Galveston, Tex.	240	250
KFLZ,	Anita, Iowa	278	100
KFMR,	Sioux City, Iowa	261	100
KFMX,	Northfield, Minn.	336.9	500
KFNF,	Shenandoah, Iowa	461.3	2500
KFOA,	Seattle, Wash.	454.5	1000
KFOB,	Burlingame, Calif.	226	50
KFON,	Long Beach, Calif.	233	500
KFOR,	David City, Nebr.	226	100
KFOT,	Wichita, Kans.	231	50
KFOX,	Omaha, Nebr.	248	100
KFOY,	St. Paul, Minn.	252	50
KFPL,	Dublin, Texas	252	20
KFPM,	Greenville, Texas	242	10
KFPR,	Los Angeles, Calif.	230.6	500
KFPW,	Carterville, Mo.	258	20
KFPY,	Spokane, Wash.	273	100
KFQA,	St. Louis, Mo.	280.2	5000
KFQB,	Fort Worth, Texas	410.7	2500
KFQD,	Anchorage, Alaska	227.1	100
KFQP,	Iowa City, Iowa	224	10
KFQU,	Alma (Holy City) Calif.	231	250
KFQW,	North Bend, Wash.	215.7	50
KFQZ,	Hollywood, Calif.	225.4	50
KFRB,	Beeville, Tex.	248	250
KFRC,	San Francisco, Calif.	267.7	50
KFRU,	Columbia, Mo.	499.7	500
KFRW,	Olympia, Wash.	218.8	50
KFSD,	San Diego, Calif.	345.8	1000
KFSG,	Los Angeles, Calif.	275	500
KFUL,	Galveston, Tex.	258	500
KFUM,	Colorado Springs, Colo.	239.9	100
KFUO,	St. Louis, Mo.	545.1	500
KFUP,	Denver, Colo.	234	50
KFUR,	Ogden, Utah	224	50
KFUS,	Oakland, Calif.	256	50
KFUT,	Salt Lake City, Utah	261	100
KFUU,	Oakland, Calif.	230	100
KFVD,	San Pedro, Calif.	305.4	50
KFVE,	St. Louis, Mo.	240	5000
KFVG,	Independence, Kas.	236	15
KFVI,	Houston, Texas	290.9	50
KFVN,	Fairmont, Minn.	227	50
KFVS,	Cape Girardeau, Mo.	224	50
KFVR,	Denver, Colo.	244	50
KFVY,	Albuquerque, N. Mex.	250	10
KFWA,	Ogden, Utah	261	500
KFWB,	Hollywood, Calif.	252	500
KFWC,	San Bernardino, Calif.	211.1	200
KFWF,	St. Louis, Mo.	214.2	250
KFWH,	Eureka, Calif.	254	100
KFWI,	San Francisco, Calif.	250	500
KFWM,	Oakland, Calif.	325.9	500
KFWO,	Avalon, Calif.	211.1	250
KFWU,	Placville, La.	238	100
KFWV,	Portland, Ore.	212.6	50
KFXB,	Big Bear Lake, Calif.	202.6	500
KFXD,	Logan, Utah	205.4	10
KFXF,	Colorado Springs, Colo.	250	500
KFXH,	El Paso, Texas	242	50
KFXJ,	Edgewater, Colo.	215.7	15
KFXR,	Oklahoma City, Okla.	214.2	15
KFXY,	Flagstaff, Ariz.	205.4	50
KFYF,	Oxnard, Calif.	205.4	10
KFYJ,	Houston, Texas	238	10
KFYO,	Texarkana, Tex.	209.7	10
KFYR,	Bismarck, N. Dak.	248	10
KGAR,	Tucson, Ariz.	243.8	500
KGBS,	Seattle, Wash.	209.7	10
KGBU,	Ketchikan, Alaska	229	500
KGBW,	Joplin, Mo.	282.8	
KGO,	Oakland, Calif.	361.2	5000
KGRX,	St. Joseph, Mo.	347.8	
KGTT,	San Francisco, Calif.	306.8	50
KGU,	Honolulu, Hawaii	270	500
KGW,	Portland, Ore.	491.5	1000
KGY,	Lacey, Wash.	277.6	50
KHJ,	Los Angeles, Calif.	405.2	500
KHQ,	Spokane, Wash.	394.5	1000
KJBS,	San Francisco, Calif.	220	5
KJR,	Seattle, Wash.	384.4	1000
KLDS,	Independence, Mo.	440.9	1000
KLS,	Oakland, Calif.	250	250
KLX,	Oakland, Calif.	508.2	500
KLZ,	Denver, Colo.	266	250
KMA,	Shenandoah, Iowa	461	500
KMJ,	Fresno, Calif.	234	50
KMJP,	Kansas City, Mo.	440.9	1000
KMMJ,	Clay Center, Neb.	328.9	1000
KMO,	Tacoma, Wash.	250	100
KMOX,	Kirkwood, (St. Lo)., Mo.	280.2	5000
KMTR,	Hollywood, Calif.	238	500
KNRC,	Los Angeles, Calif.	208.2	500
KNX,	Los Angeles, Calif.	336.9	500
KOA,	Denver, Colo.	322.4	5000
KOAC,	Corvallis, Ore.	280.2	500
KOB,	State College, N. M.	348.6	5000
KOCH,	Omaha, Neb.	258	250
KOCW,	Chickasha, Okla.	252	200
KOIL,	Council Bluffs, Iowa	305.9	500
KOIN,	Portland, Ore.	319	1000
KOWW,	Walla Walla, Wash.	285.5	500
KPO,	San Francisco, Calif.	428.3	1000
KPPG,	Pasadena, Calif.	229	50
KPRC,	Houston, Texas	296.9	500
KPSN,	Pasadena, Calif.	315.6	1000
KQV,	Pittsburgh, Pa.	275	500
KQW,	San Jose, Calif.	231	500
KRCA,	(Portable) Calif.	305	100
KRE,	Berkeley, Calif.	256	100
KSAC,	Manhattan, Kansas	340.7	500
KSD,	St. Louis, Mo.	545.1	500
KSL,	Salt Lake City, Utah	299.8	1000
KSMR,	Santa Maria, Calif.	209.7	100
KSO,	Clarinda, Iowa	242	500
KTAB,	Oakland, Calif.	302.8	1000
KTBI,	Los Angeles, Calif.	293.9	750
KTBR,	Portland, Ore	263	50
KTCL,	Seattle, Wash.	305.9	1000
KTHS,	Hot Springs, Ark.	374.8	750
KTNT,	Muscatine, Iowa	333.1	1000
KTW,	Seattle, Wash.	454.3	1500
KUOA,	Fayetteville, Ark.	399.8	750
KUOM,	Missoula, Mont.	244	250
KUSD,	Vermillion, S. D.	278	100
KUT,	Austin, Texas	231	500
KVOO,	Bristow, Okla.	374.8	500
KWCR,	Cedar Rapids, Iowa	278	500
KWG,	Stockton, Calif.	248	50
KWKC,	Kansas City, Mo.	236	100
KWKH,	Kennonwood, La.	329	1000
KWSC,	Pullman, Wash.	348.6	500
KWUC,	La Mars, Iowa	252	50
KWWG,	Brownsville, Texas	278	500
KYW,	Chicago, Ill.	535.4	2000
KZIB,	Manila, P. I.	349.9	20
KZKZ,	Manila, P. I.	270	100
KZM,	Oakland, Calif.	240	100
KZRQ,	Manila, P. I.	222	500
KZUY,	Baguio, P. I.	360	500
NAA,	Arlington, Va.	434.5	1000
WAAD,	Cincinnati, Ohio	258	25
WAAF,	Chicago, Ill.	278	500
WAAM,	Newark, N. J.	263	500
WAAW,	Omaha, Neb.	384.4 & 278	500
WABB,	Harrisburg, Pa.	204	10
WABC,	Asheville, N. C.	254	100
WABI,	Bangor, Me.	240	100
WABO,	Rochester, N. Y.	258	100
WABQ,	Haverford, Pa.	261	1000
WABR,	Toledo, Ohio	263	50
WABW,	Wooster, Ohio	206.8	50
WABX,	Mount Clemens, Mich.	246	500
WABY,	Philadelphia, Pa.	242	50
WABZ,	New Orleans, La.	275	50
WADC,	Akron, Ohio	258	500
WAFD,	Port Huron, Mich.	275	500
WAGM,	Royal Oak, Mich.	225.4	50
WAHG,	Richmond Hill, N. Y.	315.6	500
WAIT,	Taunton, Mass.	229	10
WAIU,	Columbus, Ohio	293.9	750
WAMD,	Minneapolis, Minn.	244	5000
WAPI,	Auburn, Ala.	248	1000
WARC,	Medford Hillside, Mass.	261	100
WATT,	Boston, Mass.	243.8	100
WBAA,	West Lafayette, Ind.	273	250
WBAK,	Harrisburg, Pa.	275	500
WBAL,	Glen Morris, Md.	246	5000
WBAO,	Decatur, Ill.	270	100
WBAP,	Fort Worth, Texas	475.9	1500
WBAW,	Nashville, Tenn.	336.1	100
WBAX,	Wilkes-Barre, Pa.	256	100
WBBL,	Richmond, Va.	299	50
WBBM,	Chicago, Ill.	226	10000
WBBP,	Petoskey, Mich.	238	200
WBBR,	Rossville, N. Y.	416.4	500
WBBS,	New Orleans, La.	252	50
WBBW,	Norfolk, Va.	222	50
WBBY,	Charleston, S. C.	268	10
WBBZ,	Chicago, Ill.	215.7	50
WBCN,	Chicago, Ill.	266	500
WBDC,	Grand Rapids, Mich.	256	500
WBES,	Takoma Park, Md.	222	100
WBNY,	New York, N. Y.	322.4	1000
WBOQ,	Richmond Hill, N. Y.	236	100
WBRC,	Birmingham, Ala.	248	50
WBRE,	Wilkes-Barre, Pa.	231	100
WBT,	Charlotte, N. C.	275	250
WBZ,	Springfield, Mass.	331.1	2000
WBZA,	Boston, Mass.	242	250
WCAC,	Storrs, Conn.	275	500
WCAD,	Canton, N. Y.	263	250
WCAE,	Pittsburgh, Pa.	461.3	500
WCAI,	University Place, Neb.	254	500
WCAL,	Northfield, Minn.	536.9	500
WCAM,	Camden, N. J.	236	250
WCAO,	Baltimore, Md.	275	100
WCAP,	Washington, D. C.	468.5	500
WCAR,	San Antonio, Texas	263	2000
WCAT,	Rapid City, S. D.	240	50
WCAU,	Philadelphia, Pa.	277.6	500
WCAX,	Burlington, Vt.	250	100
WCBA,	Allentown, Pa.	254	125
WCBD,	Zion, Ill.	344.6	5000
WCBE,	New Orleans, La.	263	5
WCBH,	Oxford, Miss.	242	50
WCBM,	Baltimore, Md.	229	100
WCBR,	Providence, R. I.	309.7	100
WCCO,	Minneapolis, Minn.	416.4	5000
WCFL,	Chicago, Ill.	491.5	500
WCFT,	Tullahoma, Tenn.	252	
WCLO,	Camp Lake, Wis.	231	50
WCLS,	Joliet, Ill.	214.2	150
WCMA,	Culver, Ind.	258.5	100
WCOA,	Pensacola, Fla.	322.1	500
WCRW,	Chicago, Ill.	239.9	
WCSH,	Portland, Me.	256	500
WCSO,	Springfield, Ohio	248	100
WCWS,	Providence, R. I.	209.7	100
WCX,	Pontiac, Mich.	516.9	5000
WDAD,	Nashville, Tenn.	226	150
WDAE,	Tampa, Fla.	273	250
WDAF,	Kansas City, Mo.	365.6	1000
WDAG,	Amarillo, Texas	263	100
WDAH,	El Paso, Tex.	267.7	50
WDAY,	Fargo, N. D.	261	50
WDBE,	Atlanta, Ga.	270	100
WDBJ,	Roanoke, Va.	229	50
WDBK,	Cleveland, Ohio	327	50
WDBO,	Winter Park, Fla.	240	500
WDBZ,	Kingston, N. Y.	233	10
WDEL,	Wilmington, Del.	266	100
WDGY,	Minneapolis, Minn.	263	500
WDOD,	Chattanooga, Tenn.	256	500
WDRC,	New Haven, Conn.	268	100
WDWF,	Cranston, R. I.	440.9	500
WDZ,	Tuscola, Ill.	278	100
WEAF,	New York, N. Y.	491.5	5000
WEAI,	Ithaca, N. Y.	254	500
WEAM,	North Plainfield, N. J.	261	250
WEAN,	Providence, R. I.	270	500
WEAO,	Columbus, Ohio	293.9	500
WEAR,	Cleveland, Ohio	389.4	750
WEAU,	Sioux City, Iowa	275	100
WEBC,	Superior, Wis.	242	100
WEBH,	Chicago, Ill.	370.2	2000
WEBJ,	New York, N. Y.	272.6	500
WEBL,	New York, N. Y.	226	100
WEBQ,	Harrisburg, Ill.	225.4	10
WEBR,	Buffalo, N. Y.	244	100
WEBW,	Beloit, Wis.	268	500
WEBZ,	Savannah, Ga.	263	50
WEEI,	Boston, Mass.	348.6	500
WEHS,	Evanston, Ill.	202.6	10
WEMC,	Berrien Springs, Mich.	285.5	500
WENR,	Chicago, Ill.	266	1000
WEW,	St. Louis, Mo.	360	1000
WFAA,	Dallas, Texas	475.9	500
WFAM,	St. Cloud, Minn.	273	10
WFAV,	Lincoln, Nebr.	275	500
WFBC,	Knoxville, Tenn.	250	50
WFBE,	Seymour, Ind.	226	10
WFBG,	Altoona, Pa.	278	100
WFBH,	New York, N. Y.	273	500
WFBJ,	Collegeville, Minn.	236	100
WFBL,	Syracuse, N. Y.	252	100
WFBM,	Indianapolis, Indiana	268	250
WFBR,	Baltimore, Md.	254	100
WFBZ,	Galesburg, Ill.	254	20
WFDF,	Flint, Mich.	294	100
WFI,	Philadelphia, Pa.	394.5	500
WFKB,	Chicago, Ill.	217.3	500
WFLA,	Clearwater, Fla.	265.3	500
WFRL,	Brooklyn, N. Y.	205.4	100
WGAL,	Lancaster, Pa.	248	10
WGBB,	Freeport, N. Y.	244	500
WGBC,	Memphis, Tenn.	278	10
WGBF,	Evansville, Ind.	236	500
WGBI,	Scranton, Pa.	240	100
WGBR,	Marshfield, Wis.	229	10
WGBS,	New York, N. Y.	315.6	500
WGBU,	Fulford, Fla.	278	500
WGBX,	Orono, Me.	234.2	500
WGCP,	Newark, N. J.	252	500
WGES,	Chicago, Ill.	250	500
WGHP,	Detroit, Mich.	270	1500
WGMU,	Richmond Hill, N. Y.	236	100
WGN,	Chicago, Ill.	302.8	1000
WGR,	Buffalo, N. Y.	319	750
WGST,	Atlanta, Ga.	270	500
WGY,	Schenectady, N. Y.	379.5	50000
WHA,	Madison, Wis.	535.4	750
WHAD,	Milwaukee, Wis.	275	500
WHAM,	Rochester, N. Y.	278	100
WHAP,	New York, N. Y.	431	500
WHAR,	Atlantic City, N. J.	275	500
WHAS,	Louisville, Ky.	399.8	500
WHAZ,	Troy, N. Y.	379.5	500
WHB,	Kansas City, Mo.	365.6	500
WHBA,	Oil City, Pa.	250	10
WHBC,	Canton, Ohio	254	10
WHBD,	Bellefontaine, Ohio	222	20
WHBF,	Rock Island, Ill.	222	100
WHBG,	Harrisburg, Pa.	231	20
WHBJ,	Fort Wayne, Ind.	234	50
WHBL,	Chicago, Ill.	215.7	50
WHBM,	Chicago, Ill.	215.7	20
WHBN,	St. Petersburg, Fla.	238	10
WHBP,	Johnstown, Pa.	256	100
WHBQ,	Memphis, Tenn.	233	50
WHBR,	Cincinnati, O.	215.7	800
WHBU,	Anderson, Ind.	218.8	10
WHBW,	Philadelphia, Pa.	215.7	100
WHBY,	West De Pere, Wis.	250	50
WHDI,	Minneapolis, Minn.	278	500
WHEC,	Rochester, N. Y.	258	100
WHK,	Cleveland, Ohio	272.6	1000
WHN,	New York, N. Y.	361.2	500
WHO,	Des Moines, Iowa	526	5000
WHT,	Deerfield Ill.	399.8	3500
WIAD,	Philadelphia, Pa.	250	100
WIAS,	Burlington, Iowa	254	100
WIBA,	Madison, Wis.	236	100
WIBG,	Elkins Park, Pa.	222	50
WIBH,	New Bedford, Mass.	209.7	50
WIBI,	Flushing, N. Y.	218.8	50
WIBJ,	Chicago, Ill.	215.7	50
WIBM,	Chicago, Ill.	215.7	10
WIBO,	Chicago, Ill.	226	1000
WIBR,	Steubenville, Ohio	240	50
WIBS,	Elizabeth, N. J.	302.6	10
WIBU,	Poynette, Wis.	222	20
WIBW,	Logansport, Ind.	220	100
WIBX,	Utica, N. Y.	305.4	150
WIBZ,	Montgomery, Ala.	230.6	10
WIL,	St. Louis, Mo.	273	250
WIOD,	Miami Beach, Fla.	247.8	1000
WIP,	Philadelphia, Pa.	508.2	500
WJAD,	Waco, Texas	352.7	500
WJAF,	Ferndale, Mich.	400	
WJAG,	Norfolk, Nebr.	370	200
WJAK,	Kokomo, Ind.	254	50
WJAM,	Cedar Rapids, Iowa	268	100
WJAR,	Providence, R. I.	305.9	500
WJAS,	Pittsburgh, Pa.	275.1	500
WJAX,	Jacksonville, Fla.	336.9	1000
WJAZ,	Mount Prospect, Ill.	329.8	5000
WJBA,	Joliet, Ill.	206.8	50
WJBB,	St. Petersburg, Fla.	254	250
WJBC,	La Salle, Ill.	234	100
WJBI,	Red Bank, N. J.	218.8	250
WJBK,	Ypsilanti, Mich.	233	10
WJBL,	Decatur, Ill.	270	500
WJBO,	New Orleans, La.	268	100
WJBR,	Omro, Wis.	227.1	50
WJBT,	Chicago, Ill.	238	500
WJBU,	Lewisburg, Pa.	211.1	100
WJBV,	Woodhaven, N. Y.	469.9	500
WJBW,	New Orleans, La.	340.7	
WJBX,	Osterville, Mass.	280	
WJBY,	Gadsden, Ala.	270.1	
WJJD,	Mooseheart, Ill.	370.2	500
WJR,	Pontiac, Mich.	516.9	5000
WJY,	New York, N. Y.	405.2	1000
WJZ,	Bound Brook, N. J.	454.3	50,000
WKAF,	Milwaukee, Wis.	261	500
WKAQ,	San Juan, P. R.	340.7	500
WKAR,	East Lansing, Mich.	285.5	1000
WKAV,	Laconia, N. H.	224	50
WKBA,	Chicago, Ill.	288.3	200
WKBB,	Joliet, Ill.	214.2	100
WKBE,	Webster, Mass.	231	100
WKBG,	Chicago, Ill.	215.7	100
WKBS,	Birmingham, Ala.	225	
WKJC,	Lancaster, Pa.	258	50
WKRC,	Cincinnati, Ohio 325.9 & 422.3		1500
WKY,	Oklahoma City, Okla.	375	100
WLAL,	Tulsa, Okla.	250	100
WLAP,	Louisville, Ky.	275	20
WLB,	Minneapolis, Minn.	277.6	500
WLBL,	Stevens Point, Wis.	278	750
WLIB,	Chicago, Ill.	302.8	4000
WLIT,	Philadelphia, Pa.	394.5	500
WLS,	Crete, Ill.	344.6	5000
WLSI,	Edgewood, R. I.	440.9	500
WLTS,	Chicago, Ill.	258	100
WLW,	Harrison, Ohio	422.3	5000
WLWL,	New York, N. Y.	288.3	5000
WMAC,	Cazenovia, N. Y.	275	100
WMAF,	Dartmouth, Mass.	440.9	1000
WMAK,	Lockport, N. Y.	266	500
WMAL,	Washington, D. C.	212.6	100
WMAN,	Columbus, Ohio	280	50
WMAQ,	Chicago, Ill.	447.5	1000
WMAY,	St. Louis, Mo.	248	100
WMAZ,	Macon, Ga.	261	500
WMBB,	Chicago, Ill.	250	500
WMBC,	Detroit, Mich.	256.4	100
WMBF,	Miami Beach, Fla.	384.4	500
WMBI,	Chicago, Ill.	202.6	500

At the closing date of this magazine, the list of broadcast stations is subject to daily alterations, as regards wavelengths, power, etc. We especially request stations making changes at this time to send a notification to SCIENCE AND INVENTION, in order that broadcast listeners may be advised as soon as possible of the new conditions which they may expect in tuning in the stations.

(*Continued on page* 530)

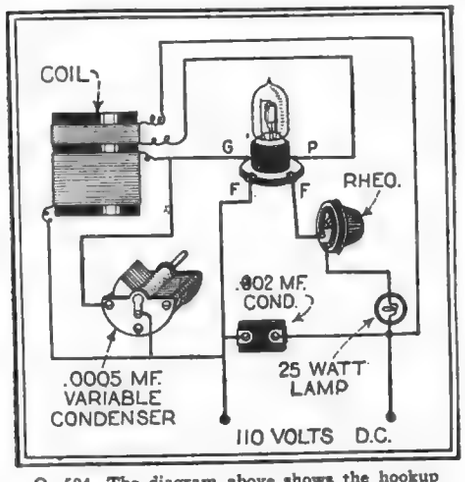
RADIO ORACLE

In this Department we publish questions and answers which we feel are of interest to the novice and amateur. Letters addressed to this department cannot be answered free. A charge of 50c. is made for all questions where a personal answer is desired.

OSCILLATOR AND WAVEMETER

(504) Q. 1. Walter Davis, Reed City, Michigan asks that a hook-up be published for a simple combination oscillator and wavemeter operating entirely from a 110-volt direct current source.

A. 1. The wiring diagram desired is shown herewith. In order that the filament of the tube



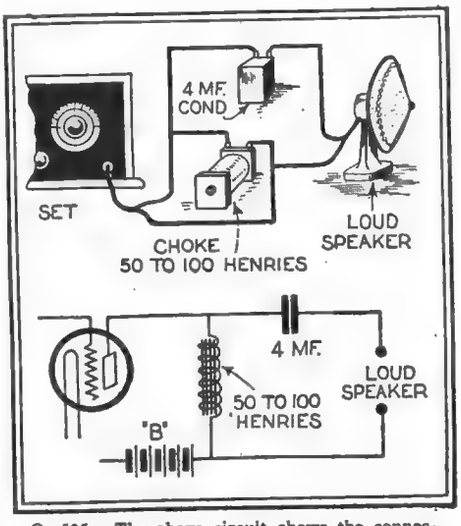
Q. 504. The diagram above shows the hookup of an oscillator and wavemeter which operates from the 110 volt lighting circuit.

may receive the proper amount of current, a lamp should be connected in series as indicated. For an 01A tube the lamp may be of 25-watt rating. For a finer adjustment a variable resistance may be connected in series with the lamp. The condenser connected across the line has a capacity of about .002 mfd. The 2 coils are closely coupled and are wound on a 3-inch diameter tube. The actual number of turns on each coil will depend upon the range of wavelengths to be covered. For the broadcast band approximately 50 turns will be required on each coil. The variable condenser may be of .0005 mfd. capacity.

PROTECTING LOUD SPEAKER

(505) Q. 1. Herbert Mellard, Boonton, Wisconsin writes that the loud speaker of his receiving set has burned out and he desires to know how this could be prevented.

A. 1. The loud speaker may be protected from a burn-out and the quality of reception may be improved at the same time by connecting a choke coil and condenser to the output of the set as shown in the diagram. A choke coil should have an inductance value between 50 and 100 henrys and a current carrying capacity of at least 30 milliamperes. The capacity of the condenser should be quite high and should preferably have a value of about 4 microfarads. This arrangement prevents current from the "B" battery from reaching the loud speaker, but allows the alternating current or modulated signals to pass through the condenser and actuate the speaker.

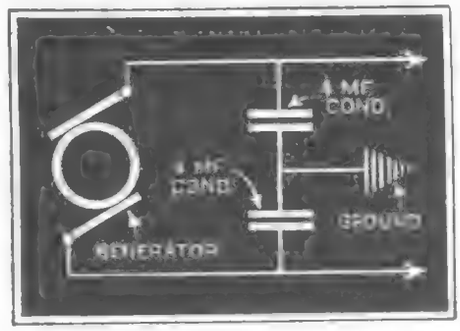


Q. 505. The above circuit shows the connection of a protective choke and condenser which keeps D.C. out of the loud-speaker.

LIGHTING PLANT NOISES

(506) Q. 1. William F. Pierce, Robinsville, Miss., writes he has experienced interfering noises caused by a home lighting plant. When the plant is running he finds it difficult to tune in the station. A remedy for this trouble is requested.

A. 1. The interfering noises which you have experienced due to the home lighting plant may be eliminated to a large extent, if not entirely, by



Q. 506. Two condensers connected as shown across the line with common terminal grounded will effectively quiet home lighting plant.

connecting two condensers, each of 4 microfarads capacity across the output and terminals of the lighting system, and grounding the common point of the condensers, as the diagram shows.

"A" BATTERY CHARGER

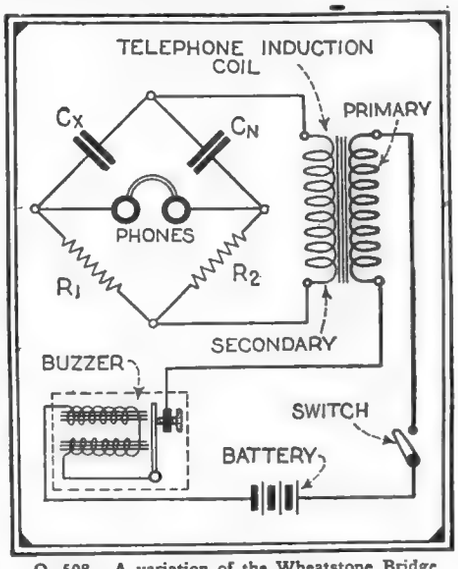
(507) Q. 1. William F. Brockenbrough, Richmond, Va., requests information on how to construct an "A" battery charger, using a type 200 or 201A tube.

A. 1. It is impossible to construct an apparatus of this sort for charging "A" batteries, because a rectifier employing a 201A tube delivers only a very slight amount of current and would be entirely unsuitable for the purpose you mention. The type 200, being a soft tube, is unsuitable even in a rectifier supplying plate current. For an "A" battery charger we recommend using a rectifier tube of the Kenotron type.

MEASURING CONDENSER CAPACITY

(508) Q. 1. Roger Harrison, Englewood, N. J., desires to know a simple method for measuring the capacity of fixed condensers.

A. 1. The connections for making capacity measurements are shown in these columns. The apparatus required is a pair of head phones, 2 resistances, R.1 and R.2, whose values are known, condenser "Cn" of known value, a telephone transformer, a small buzzer and a 6-volt battery. The buzzer is actuated by closing the switch. The bridge is then balanced by adjusting the value of either R_1 or R_2 or both until no sound is heard in the head phone. The relations then existing in the circuit are $\frac{Cx}{Cn} = \frac{R_2}{R_1}$. The capacity of the unknown condenser is then $Cx = \frac{R_2}{R_1} \times Cn$. This method of measuring capacity is an adaptation of the Wheatstone Bridge method of resistance measurement.



Q. 508. A variation of the Wheatstone Bridge principle is used in the above diagram to find capacity of condenser by comparison.

LIST OF BROADCAST STATIONS IN THE UNITED STATES

(*Continued from page 529*)

Radio Call Letter	BROADCAST STA. Location	Wave (Meters)	Power (Watts)
WMC,	Memphis, Tenn.	499.7	500
WMCA,	Hoboken, N. J.	340.7	500
WMRJ,	Jamaica, N. Y.	227.1	10
WMSG,	New York, N. Y.	302.8	500
WNAB,	Boston, Mass.	280.2	100
WNAC,	Boston, Mass.	430.1	500
WNAD,	Norman, Okla.	254	500
WNAL,	Omaha, Nebr.	258	50
WNAT,	Philadelphia, Pa.	250	500
WNAX,	Yankton, S. Dak.	244	100
WNBH,	New Bedford, Mass.	248	250
WNJ,	Newark, N. J.	348.6	150
WNOX,	Knoxville, Tenn.	268	100
WNRC,	Greensboro, N. C.	223.7	10
WNYC,	New York, N. Y.	526	1000
WOAI,	San Antonio, Tex.	394.5	2000
WOAN,	Lawrenceburg, Tenn.	282.8	500
WOAW,	Omaha, Nebr.	526	1000
WOAX,	Trenton, N. J.	240	500
WOC,	Davenport, Iowa	483.6	5000
WOCL,	Jamestown, N. J.	275.2	15
WODA,	Paterson, N. J.	391.5	500
WOI,	Ames, Iowa	270	750
WOK,	Homewood, Ill.	217.3	5000
WOKO,	Peekskill, N. Y.	233	50
WOO,	Philadelphia, Pa.	508.2	500
WOOD,	Grand Rapids, Mich.	242	1000
WOP,	(Airplane	300	100
WOQ,	Kansas City, Mo.	278	1000
WOR,	Newark, N. J.	405.2	500
WORD,	Batavia, Ill.	275	5000
WOS,	Jefferson City, Mo.	440.9	500
WOWF,	Edgewood, R. I.	440.9	500
WOWL,	New Orleans, La.	270	10
WOWO,	Fort Wayne, Ind.	227	500
WPAK,	Fargo, N. Dak.	275	100
WPAP,	Cliffside, N. J.	360	100
WPCC,	Chicago, Ill.	258	500
WPDQ,	Buffalo, N. Y.	205.4	50
WPG,	Atlantic City, N. J.	299.8	5000
WPRC,	Harrisburg, Pa.	215.7	100
WPSC,	State Colleg[illegible], Penna.	261	500
WQAA,	Parkesburg, Pa.	220	500
WQAC,	Amarillo, Tex.	234	125
WQAE,	Springfield, Vt.	246	50
WQAM,	Miami, Fla.	263	500
WQAN,	Scranton, Pa.	250	100
WQAO,	Cliffside, N. J.	360	100
WQJ,	Chicago, Ill.	447.5	500
WRAF,	Laporte, Ind.	224	100
WRAK,	Escanaba, Mich.	256.3	100
WRAM,	Galesburg, Ill.	244	100
WRAV,	Yellow Springs, Ohio.	263	100
WRAW,	Reading, Pa.	238	10
WRAX,	Gloucester City, N. J.	268	500
WRBC,	Valparaiso, Ind.	278	500
WRC,	Washington, D. C.	468.5	1000
WRCO,	Raleigh, N. C.	252	100
WREC,	Whitehaven, Tenn.	254	10
WREO,	Lansing, Mich.	285.5	500
WRHF,	Washington, D. C.	256	50
WRHM,	Minneapolis, Minn.	252	50
WRK,	Hamilton, Ohio	270	100
WRM,	Urbana, Ill.	273	500
WRMU,	Richmond Hill, N. Y.	236	100
WRNY,	New York, N. Y.	374.8	500
WRR,	Dallas, Tex.	246	500
WRST,	Bay Shore, N. Y.	215.7	150
WRVA,	Richmond, Va.	256	1000
WSAI,	Mason, Ohio	325.9	5000
WSAJ,	Grove City, Pa.	229	250
WSAN,	Allentown, Pa.	229	100
WSAR,	Fall River, Mass.	254	100
WSAX,	Chicago, Ill.	268	100
WSAZ,	Pomeroy, Ohio.	244	50
WSB,	Atlanta, Ga.	428.3	1000
WSBC,	Chicago, Ill.	209.7	1000
WSBF,	St. Louis, Mo.	273	250
WSBT,	South Bend, In.	275.1	500
WSDA,	New York, N. Y.	263	250
WSKC,	Bay City, Mich.	261	100
WSM,	Nashville, Tenn.	282.8	1000
WSMB,	New Orleans, La.	319	500
WSMH,	Owosso, Mich.	240	20
WSMK,	Dayton, Ohio.	275	500
WSOE,	Milwaukee, Wis.	246	500
WSRO,	Hamilton, Ohio.	252	100
WSSH,	Boston, Mass.	261	100
WSUI,	Iowa City, Iowa.	483.6	500
WSVS,	Buffalo, N. Y.	218.8	50
WSWS,	Wooddale, Ill.	275.1	1000
WTAB,	Fall River, Mass.	266	100
WTAD,	Carthage, Ill.	236	50
WTAG,	Worcester, Mass.	545.1	500
WTAL,	Toledo, Ohio	252	100
WTAM,	Cleveland, Ohio.	389.4	3500
WTAP,	Cambridge, Ill.	242	50
WTAQ,	Eau Claire, Wis.	254	1000
WTAR,	Norfolk, Va.	261	100
WTAW,	College Station, Texas.	270	500
WTAX,	Streator, Ill.	231	50
WTAZ,	Lambertville, N. J.	261	15
WTIC,	Hartford, Conn.	475.9	500
WWAE,	Plainfield, Ill.	242	500
WWJ,	Detroit, Mich.	352.7	1000
WWL,	New Orleans, La.	275	100

Scientific Humor

WHY NOT? THE MISSISSIPPI FLOWS UPHILL

A colored preacher was telling his congregation about the children of Israel passing right through the Dead Sea.

"It was very simple you know. Water generally flows down hill, but in this 'ere case things was jes' reversed. The water done turn right around and flow right back up hill, leavin' the bottom of de sea jes' as dry as a cracked lip. Den all de poor children had to do wus jes' walk across."

"But," interrupted a young colored brother, "that would be against the law of gravitation. It couldn't be done."

"You jes' mind you own business suh! Dis what I am talking about was three thousand years ago. That was befo' the law of gravitation done been discovered."—*Oscar LeNormand.*

ALL PARTS REPLACED

ANGRY MAN: "You told me when I bought a bicycle for my boy that you would replace any broken part."

SALESMAN: "Absolutely, what does he want?"

ANGRY MAN: "He wants two biceps muscles, a couple of knee pans, one elbow and two yards of cuticle, and he wants them right away."—*George Herezo, Reporter No.* 21670.

AIRY RESISTANCE

BO: "Why do they call her 'Bubbles?'"

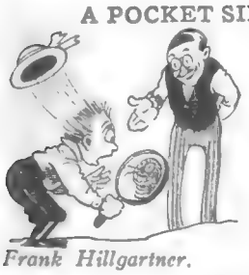
ZO: "'Cause she effervesces with joy when you ask her out but bursts when you touch her!"—*George McLaughlin.*

WE'LL USE THIS ALSO

A BARBER TO A CUSTOMER: "Do you want a hair cut?"

CUSTOMER: "No, I want them all cut."—*Douglas Wight.*

A POCKET SIDE SHOW



SON: "Papa, give me a nickel to see the sea serpent?"

TIGHTWAD PAPA: "Wasteful boy, here is a magnifying glass; go look at a worm.''—*Frank Hillgartner.*

A SAFETY FACTOR

The high pressure lightning rod salesman concluded his demonstrations with the emphatic statement: "Just think, it will draw lightning thirty feet."

"Pu-pu-putit thirty feet away from the house," said the farmer who stuttered.—*J. E. Johnson.*

WE GO UP IN THE AIR AT THIS

RUB: "Did you know that flying machines are mentioned in the Bible?"

DUB: "No."

RUB: "Why, Esau sold his heirship to his brother Jacob."—*Clifton Ask.*

SOME DON'T LAY ANY

PROFESSOR: "Why does a hen lay eggs only in the daytime?"

STUDENT: "Because she is a rooster at night.—*A. Schwerer.*

First Prize $3.00

THE LIMITATIONS OF SCIENCE

John was sent to study mathematics, and the teacher told him it was a true science.

"For instance," he said, "if it takes one man twelve days to build a house, then twelve men can build it in a day."

John replied: "And if it takes two hundred and eighty-five men to build it in an hour, seventeen thousand two hundred and eighty in a minute, then one million, thirty-six thousand, eight hundred men can put it up in a second. Now I don't believe they could lay a single brick in that time. Again, if one ship can cross the Atlantic in twelve days, twelve ships should be able to cross it in one day. I don't believe that either, so I'm not going to study mathematics," and Johnny left the teacher studying it himself.

—*Henry Neff.*

WE receive daily from one to two hundred contributions to this department. Of these only one or two are available. We desire to publish only scientific humor and all contributions should be original if possible. Do not copy jokes from old books or other publications as they have little or no chance here. By scientific humor we mean only such jokes as contain something of a scientific nature. Note our prize winners. Write each joke on a separate sheet and sign your name and address to it. Write only on one side of sheet. We cannot return unaccepted jokes. Please do not enclose return postage.

All jokes published here are paid for at the rate of one dollar each, besides the first prize of three dollars for the best joke submitted each month. In the event that two people send in the same joke so as to tie for the prize, then the sum of three dollars in cash will be paid to each one.

THE ROCK PILE

1ST GUEST: "These cakes are hard as stone!"

2ND GUEST: "Sure, didn't you hear her say, 'take your pick' when she passed them around?"—*Edward D. Muir.*

IF WE LIVE LONG ENOUGH IT WILL!

"Oh, doctor, do you think the scar will show?" asked the fair young appendicitis patient.

"Can't say, my dear, I'm not setting the styles this year."—*Mr. M. Eisenstadt, Reporter No.* 25576.

ELECTRICITY A FOOD

PHYSIOLOGY TEACHER: "Johnny name a few important foods."

JOHNNY: "Electricity—"

PHYSIOLOGY TEACHER: "What—electricity a food?"

JOHNNY: "Yes, my physics teacher said it keeps wire alive."—*Ivy M. Howard, Reporter No.* 19697.

HEY—HAY

CITY BRED (pointing to haystack): "What kind of a house is that?"

COUNTRY BRED: "That ain't a house, that's hay."

CITY BRED: "Say! you can't fool me. Hay doesn't grow in a lump like that."—*Lawrence A. Brown, Reporter No.* 23853.

WE'LL TRY THIS

"I went home quite a bit under the weather last night and my wife didn't suspect a thing."

"Couldn't she smell your breath?"

"That's just it. I ran the last block home and when I got to her I was all out of breath."—*Lawrence A. Brown, Reporter No.* 23583.

NO MISTAKE, ONLY A JOKE

ED: "Did Bill get his perpetual motion invention published in *Science and Invention?*"

TED: "Yes, he addressed it to Scientific Humor by mistake."—*L. E. Carpenter.*

ETYMOLOGY

SON: "What is the difference between a train and a ship?"

FATHER: "A train travels on land and a ship on water."

SON: "Then why is it that when goods are sent by train it's called a *ship*ment and when they are sent by boat it's called a *cargo*?"

—*Gustav Natapoff.*

PLAY ON A DENTAL DRILL

A recruit was ordered to Sgt. Saas, Detail Sgt., to learn something about firing data instruments, and when told to report was heard to say, "It will be easy for me to learn as I can play any instrument made."—*Corporal John P. Olszewski.*

IT'S BOUND TO COME THOUGH

RASTUS: "Nigger, ah sho does believe in dis evolution theory; you shoe does look like you 'volved from a monkey."

BROWN: "Nigger, ah believes in evolution, too, an' nigger you looks like you ain't 'volved yet."—*Fred Deniston.*

IT SHOULD BE

CUSTOMER (to photographer who has only been in business a short time): "How's the photography business?"

PHOTOGRAPHER: "Oh, it's developing."—*O. Wills.*

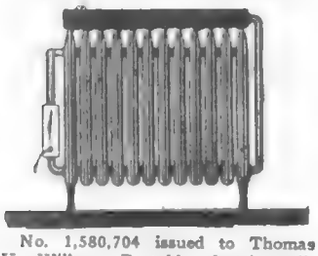
BOTH IN THE HEAD

GUSSIE: "The dentist told me I had a large cavity that needed filling."

MARY: "Did he recommend an course of study?"—*M. R. Ber*

LATEST PATENTS

PORTABLE RADIATOR

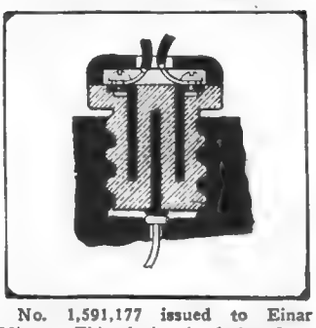


No. 1,580,704 issued to Thomas H. Willson. Portable electric radiator of a new design is illustrated above. The radiator consists of three distinct units. At the left of the drawing will be seen an electric coil heater which heats the water by contact. On top of the radiator is placed a hollow expansion chamber, which also acts as heat deflector to aid in ventilation. The radiator proper is partially filled with water, and the steam is permitted to flow into the expansion chamber.

FOLDING COMB

No. 1,579,143 issued to Michael Rabb. Hair comb recently patented and illustrated above exhibits several new features. It is arranged to fold transversely so that it occupies a space one-third of its normal length. When in use it is held in position by two clips which are movable inwardly to permit the device to be folded. The clips are made sufficiently strong to permit the user to employ this comb in the usual manner. The comb may be considered more useful than the usual pocket variety, due to its large size when extended, but it is at the same time very compact when folded.

LIGHT PLUG AERIAL



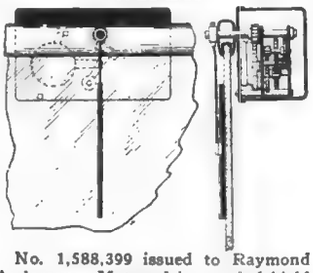
No. 1,591,177 issued to Einar Minge. This device is designed to act as an antenna for a radio set to be connected to light or other wired circuits so as to draw off or collect only the high frequency currents present therein, without interference with, or by, the local currents with low frequency in the same circuit. No direct connection to the wired circuit is afforded, but a capacitative coupling permits radio frequency currents to pass to the set and restrains the line currents.

BOTTLE SAFETY HOLDER

No. 1,580,741 issued to Thomas John Lilly. The objects of this invention, which consists of a clamp to hold milk bottles, are to safeguard the contents of the bottle; to afford sanitary precautions in the delivery of milk in bottles; to facilitate the removal of the bottle by the housewife without resorting to keys, latches or other fastenings; to avoid great losses to the milk dealers

through the theft of bottles; and generally to provide a simple device within easy reach of the consumer so far as price is concerned and of a durable nature. The milk bottles are locked in position by a long pin which holds the clamp tightly against the neck of the bottle. This pin is so placed that it is impossible to remove it while the door is closed, but it may be easily removed when the door is open. The milk dealer simply snaps the clamp down after inserting the bottles, and the lock is automatically closed.

ELECTRIC WINDSHIELD WIPER



No. 1,588,399 issued to Raymond Anderson. Motor driven windshield cleaners used heretofore, if we should believe the inventor, have not been entirely satisfactory for several reasons. In the motor driven windshield cleaner most commonly used, the cleaner is oscillated continuously by a motor, but the continuous oscillating movement is objectionable because the cleaner is too frequently in front of the driver and obstructs his vision, and furthermore, the weight of the motor with the mechanism connecting it to the cleaner is excessive. This invention provides a windshield cleaner which is operated intermittently through the medium of a small continuously rotating motor which not only requires little current to run it, but is light in weight and admits of a construction which is practically noiseless and free of vibration inherent to its own construction and operation.

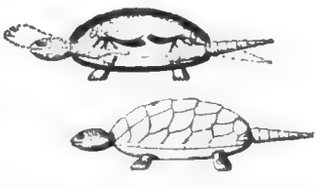
RECEIVER ATTACHMENT

No. 1,580,938 issued to Clifford A. Wolf. The tired business man should find in this invention some relief from his worries. It consists of a metal frame which clips on to the end of the telephone receiver and is so formed that it rests upon the shoulder and makes it unnecessary to hold the receiver to the ear. The patent papers do not say what happens to the other end of the receiver, so we will not guarantee that this device will increase your business more than your vocabulary.

INFRA-RED PAD

No. 1,589,338 issued to George Starr White. This invention relates to an appliance adapted to be held against the body of a subject, wherein ultra-red or infra-red rays are generated and passed through a screen which includes all of the visible rays of the spectrum and substantially all the ultra-violet rays. The appliance comprises the combination of an ultra-red ray generator and a covering sheet adapted to be so positioned that it may be interposed between the generator and the body of the subject. The appliance is flexible so that it adapts itself to the contour of any part of the body. Scientific investigation has demonstrated that ultra-red rays penetrate deeply into the body and are therein converted into heat. This heat has the property of stimulating the vascular system, thereby serving as a remedial agency.

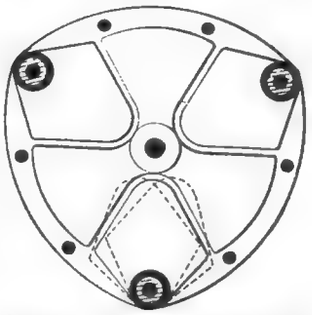
FLY POWER TOY



No. 1,591,905 issued to Oscar C. Williams. An artificial turtle made of pressed metal, paper, nut shells or other material is arranged as shown in the drawing above so that several flies or other insects may be introduced into the body. The flies in their movements strike against the pivoted levers connected to the head, tail and feet of the turtle and cause it to move in a life-like manner.

RADIO CONDENSER

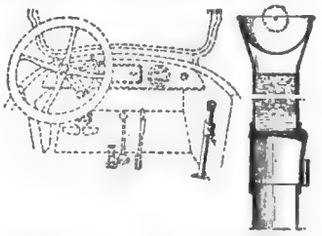
No. 1,588,438 issued to Harold N. Bliss. This new type of condenser appears to be about the most compact arrangement of gang condensers which has been proposed. A common rotor is provided which rotates within three separate sets of stator plates distributed as shown in the



photograph, so that a cascade radio frequency amplifier or similar device may be operated from one control. The stator plates are made movable about a pivot so that the circuits may be balanced to compensate for differences in the constants of the radio-frequency transformers.

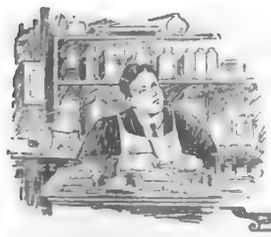
SAFETY ASH TRAY

No. 1,588,565 issued to May Wing. The idea embodied in this invention is to provide a device, especially adapted for use on automobiles, so constructed that any live ashes or stubs of cigarettes or cigars introduced into it will positively be extinguished before the contents of the tray are emptied on the ground or elsewhere. By reason of the use of

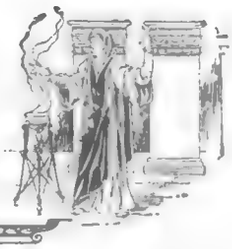


this device on an automobile, there will be no chance of any smoldering and live ashes being deposited on the ground in dry grass or leaves, and possibly starting a fire, assuming of course that the smoker makes use of the tray, which seems quite plausible in design. The user, after depositing any ashes, matches or stubs in a bowl at the top of this device, will upset the bowl into a funnel by turning a knob. This funnel leads the ashes into a water-filled pipe, thus definitely extinguishing the burning material. The bowl may then be again used, and the upsetting operation repeated, without necessarily emptying the water, which can be left in the pipe until refilling means are handy. The pipe is kept filled to a point where there is no danger of the water splashing out from the top of the funnel with any movement of the car.

NOTICE TO READERS. The above illustrated and described devices have recently been issued patent protection but are not as yet to our knowledge available on the market. We regret to advise that it is impossible to supply the names and addresses of inventors of the above devices to any of our readers. The only records available, and they are at the Patent Office at Washington, D. C., give only the addresses of the inventors at the time of application for a patent. Many months have elapsed since that time, and those records are necessarily inaccurate. Therefore, kindly do not request such information. —EDITOR.



THE ORACLE

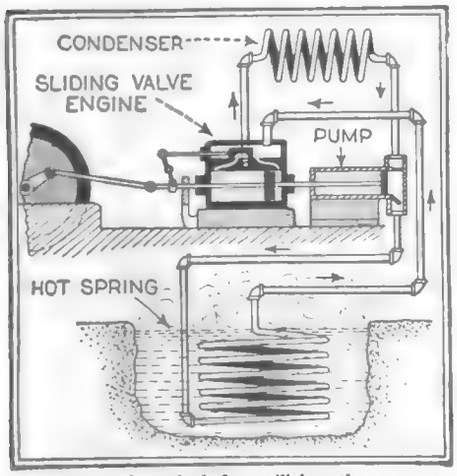


The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all but only matter of sufficient interest will be published. Rules under which questions will be answered:

1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink; no penciled matter considered.
3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to this department cannot be answered by mail free of charge.
4. If a quick answer is desired by mail, a nominal charge of 50 cents is made for each question. If the questions entail considerable research work or intricate calculations, a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

USING HOT SPRINGS

(2123) Q. 1. E. Hjartarson, Reykjavik, Iceland, asks us to give him our opinion as to the best practical method to use the energy, as electric or driving power, which is contained in the hot springs of Iceland. The problem must take into consideration the fact that the temperature of the springs is below the boiling point of water—actually about 70 to 80°C. He suggests the use of thermo-electric cells.



A suggested method for utilizing the energy contained in hot springs.

A. 1. The most obvious way of utilizing the heat of your hot springs would be to run a regular little steam engine with them, using some easily vaporized fluid instead of water to drive the engine. Such a fluid might be ether or gasoline, or some of the paraffins, and while the efficiency would undoubtedly be low, as you are utilizing natural heat or really waste heat, this would not matter. The problem you give us, however, has never been adequately solved.

ATMOSPHERIC PRESSURE

(2124) Q. 1. E. S. Spindler, S. San Francisco, Calif., asks: What if anything has atmospheric pressure to do with the process of breathing?

A. 1. As the atmospheric pressure is decreased, the amount of oxygen absorbed by the lungs is correspondingly decreased and consequently breathing has to be accomplished at a faster rate than ordinarily, in order to provide a sufficient amount of oxygen for the system.

( ) Q. 2. If a pair of beef lungs, freshly taken from the carcass without injury to the air passages, are placed inside an air-tight box with the open end of the trachea protruding through a hole in one side of the box, and the hole sealed up airtight around the trachea, will the lungs expand when the air is exhausted from the inside of the box? That is, would atmospheric pressure force outside air in through the trachea until the lungs are expanded to their full capacity, or would the lungs remain collapsed?

A. 2. The atmospheric pressure would cause the lungs to expand in precisely the same manner that it would cause a rubber balloon to expand under the same conditions.

ANTI-FROSTING COMPOUND

(2125) Q. 1. Thomas L. Winn, Somerville, Mass., inquires for a practical working formula for a preparation to keep window glass from frosting in cold weather. He has tried alcohol and glycerine, but finds the effect only temporary and the smell very disagreeable.

A. 1. A good formula to prevent windows from frosting is as follows:—Mix together 1000 parts of 62% alcohol and 55 parts of glycerine. Add something to the mixture to improve the odor, such as a few drops of oil of amber. Allow the mixture to settle and clarify and apply to the glass with a soft cloth. This is practically the only satisfactory formula for the purpose you require and the effect is quite lasting.

WINNERS in the "What Can You Do With This Board?" Contest will be announced in the November number.

THE ATOMIC THEORY

(2126) Q. 1. J. C. Thomas, Berkshire, England, asks: Why is helium not decomposed into hydrogen as other elements are decomposed into helium and hydrogen?

A. 1. It is found that the radio-active elements are those of high atomic weight. Does it not seem more natural that an element of an atomic weight of 238 should disintegrate rather than one of an atomic weight of only 4? No one can tell what the future will bring out, and chemistry may yet disintegrate the elements of low atomic weights.

Q. 2. Why has hydrogen a fractional atomic number, while all other known elements have whole atomic numbers?

A. 2. Hydrogen was formerly taken as unity in the table of atomic weights. The effect of this was to throw a quantity of decimals into the atomic weights of other elements. By taking oxygen at 16 the atomic weights of other elements are made more nearly integral, and hydrogen loses its integral figure of atomic weight.

Q. 3. Do the statements in questions one and two tend to prove that hydrogen is not an element at all but merely a collection of negative electrons?

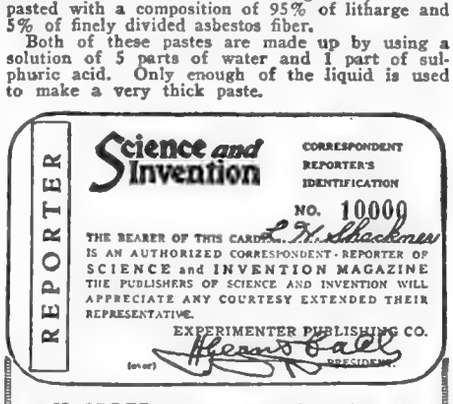
A. 3. As hydrogen possesses mass it cannot well be taken as made up of electrons, as an electron is almost void of mass, the mass of an atom being almost entirely in its positive (+) nucleus. As like charges repel like, how could a fixed collection of (—) electrons be conceived of? It is the positive nucleus that holds negative electrons together.

STORAGE BATTERY PLATES

(2127) Q. 1. Forrest M. Wogoman, Marion, Indiana, asks us for information about the pastes used for making storage "B" batteries.

A. 1. The positive plates are pasted with a composition made as follows. Red lead 70%, litharge 8%, graphite 12%, whites of eggs 10%. The latter acts as a binder. The negative plates are pasted with a composition of 95% of litharge and 5% of finely divided asbestos fiber.

Both of these pastes are made up by using a solution of 5 parts of water and 1 part of sulphuric acid. Only enough of the liquid is used to make a very thick paste.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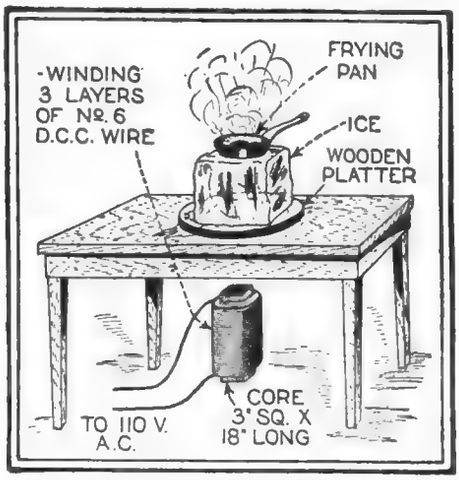
FRYING EGGS ON ICE

(2128) Q. 1. Paul H. Deaton, Smithville, Mo., requests information as to the method employed by magicians in frying eggs on ice.

A. 1. The experiment you mention is accomplished by means of a large powerful A.C. magnet concealed under the table upon which ice is placed. The intense magnetic field causes the frying pan placed on top of the ice to become hot enough to fry the egg. The core of the magnet used should be constructed of silicon steel strips and should be 18 inches long by 3 inches square. This should be wound for its entire length with three layers of No. 6 DCC magnet wire. It will draw about 40 amp.



How to fry eggs in a pan placed on top of a cake of ice. The induced currents in the pan heat it.

CRYSTAL DETECTOR

(2129) Q. 1. Geo. A. Gerber, Burlington, Wis., requests data on the theory and practical operation of crystal detectors.

A. 1. The basic action of the crystal detector, or rectifier, as it is frequently and correctly called, is not due to any heat either at the surface or in the interior of the crystal, even though the application of a temperature in the neighborhood of 110° or more, improves the operation of the crystal detector, this does not necessarily mean at all that the device is heat operated, but simply means that the electronic structure of the crystal polarizes or aligns itself better at a high temperature than it does at a low temperature.

This matter of the action of crystal detectors has been thoroughly thrashed out for fifteen years and more by several investigators particularly by Mr. Greenleaf Whittier Pickard, Newton Center, Massachusetts, whose articles describing the rectifier action were published about 1910 in "Electrical Review and Western Electrician" Magazine, which can be referred to at public libraries. Also many of the modern radio text books cover this action of the crystal rectifier, and briefly expressed, it boils down to the fact that the crystal, having one electrode of relatively small area, permits a current to pass through it several hundred times better in one direction than it does in the other. As Professor Pickard and other investigators have pointed out, some crystals serve as rectifiers to a much better degree when they are slightly polarized by a low potential battery current applied by a finely adjusted device, such as a potentiometer. H. W. Secor, Managing Editor, of SCIENCE AND INVENTION published an exhaustive article on this with curves in "Modern Electrics" in 1910, which article was prepared in collaboration with Prof. Pickard.

One thing in favor of the crystal detectors is that the voice reproduction is very perfect and practically free from any noise, such as occurs when a vacuum tube detector is used. The writer has never seen a V.T. detector yet that gave clear speech without some steaming noise.

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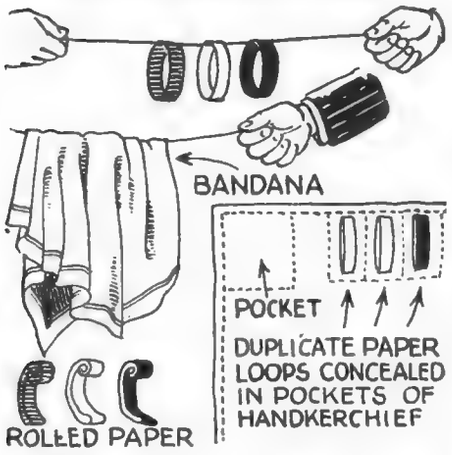
The Chameleon Bands



Endless paper bands of different colors are placed on a string, the ends of which are held by a spectator. The magician can remove any of the bands requested.

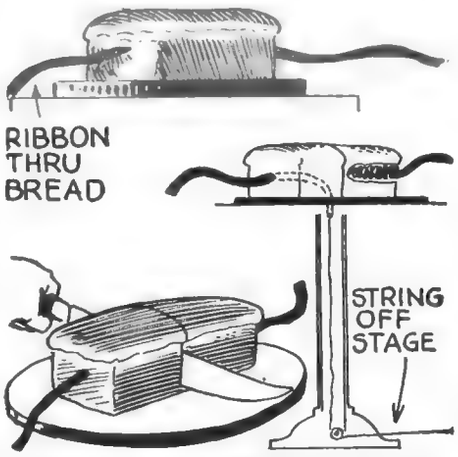
THREE endless loops of differently colored, paper are arranged on a string as illustrated and two spectators are requested to hold the opposite ends of the string. A large bandana is displayed and the bands are covered with it. One of the spectators suggests a color and the performer reaching beneath the handerchief mystically removes the chosen colored band from the string, the band itself being intact, and the string also being none the worse following this removal. The diagram explains the secret of the stunt. When one of the bands is to be removed it is torn, placed into the empty pocket and a corresponding duplicate is removed from the kerchief and displayed.

The Mystic Bread

A LOAF of bread through which a ribbon has been passed and which projects from either end is displayed. A magician takes a knife and divides the loaf in half with a cut through the center thereby apparently also cutting ribbon. The pieces of bread are separated slightly to show that the ribbon has been cut, then they are joined together and the ribbon withdrawn intact.

Two pieces of ribbon are used.

One was tucked into one end of the bread and the other is attached to a piece of string working down into table leg and into hands of assistant off stage. As the ribbon is drawn from bread after the cut the assistant gradually pulls the other end down into table leg and causes it to disappear.

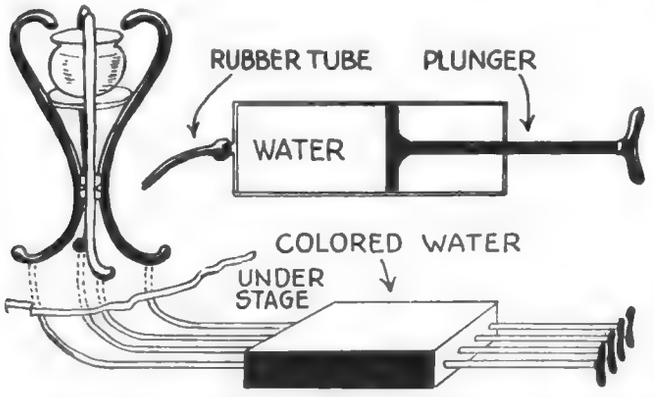


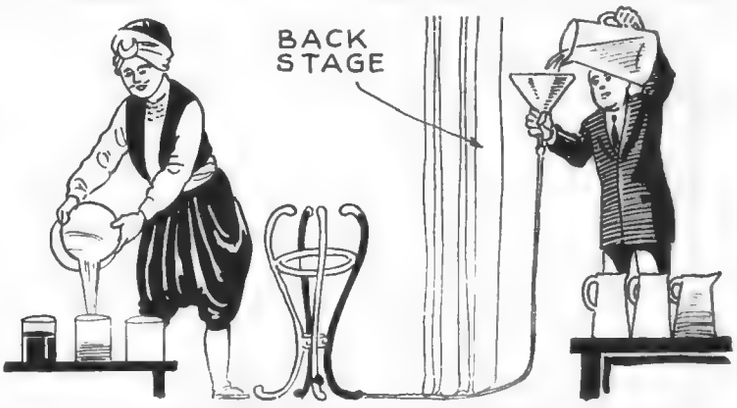
After passing a ribbon through a loaf of bread, the magician cuts the loaf, separates the halves and continues to draw the ribbon out. The method is here described.

The Paper Birds

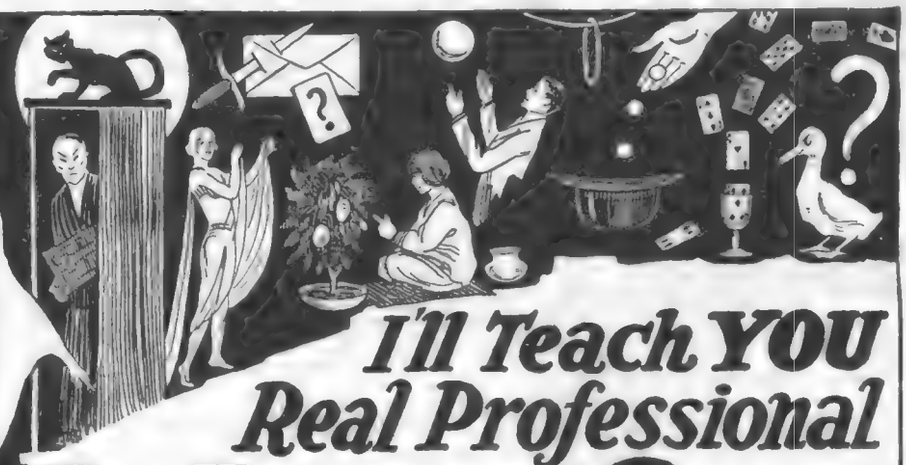
By this system the magician can convert two paper birds placed in the pages of a book into real live birds which fly out from between the pages.

A LARGE book is brought forth by wizard and a page or two is torn out of this book and handed to a spectator who is requested to cut two birds out of paper. These cut birds are placed in pages of the volume from which they were originally removed and a few words of enchantment uttered. A moment later the book is opened and two live doves fly out of the book itself. The pages of the book can be shown to be whole so that the spectators will not suspect that a box is found within pages. The book although of innocent appearence has a special compartment arranged at back. When opened at proper page the compartment is opened.





AN Orientally-clad Hindu passes a large ornamented bowl for inspection and then places the same in position upon a thin skeleton stand designed to receive it and resembling the stand found in our illustration. The bowl itself may be semi-transparent or perfectly transparent depending on whether or not the magician desires to cover it while it mysteriously fills itself. Making a few passes over the bowl it is found to be brim full of water which is poured into transparent containers. Each time that the bowl is filled it contains a differently colored solution, the colors being requested by members in the audience. The illustration clearly shows the method of operation. Beneath the stage an attendant operates one of the pumps forcing the previously prepared colored solution through the legs of the stand and into the bowl. For lyceum entertainment the method illustrated at the right may be employed in which the assistant utilizes the force of gravity to fill the bowl. In this particular method, after every filling the pipe must be laid flat on the floor so as to drain any colored water remaining in the upright portion of the stand and the rubber hose.



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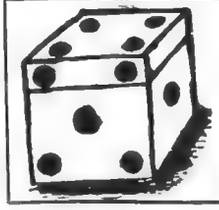

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By "DUNNINGER"

(*Continued from page* 503)

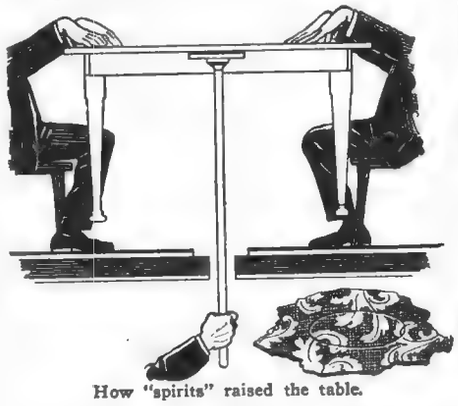
to a sort of combination parlor and sitting room, the air thick with some sort of oriental incense the like of which I have never before come across.

The old woman who ushered us into this room was about as old, in looks, as the much spoken of Ann. She looked a thousand years old. Her skin was parched and dry . . . her eyes looked through us and she seemed to be thinking . . . thinking . . . thinking . . .

Not a word out of her. Not even a "good evening."

Bad as the night was a cheerful word or two would have made us feel a bit better. But no . . . this parched specimen reminded us of the sphinxes of ancient Egypt. Divested of our coats, hats and rubbers the sphinx gathered them up, turned and left the room. The door closed after her and she never put her hand on the door.

Strange? Yes . . . and with that odor of smouldering incense we were thinking that all the mysteries of heaven and earth were to take place in that house.



How "spirits" raised the table.

Suddenly . . . into the room walked a tall, handsome creole. She was one of the most beautiful of her type I have ever seen and I have played in the states where they are in abundance.

"Good evening," she ventured. "Very bad weather we are having."

"It certainly is," replied my friend, "the storm doesn't seem to cease."

"Like the marvels of the worlds we know nothing of," she returned. He voice was like that of a bell, clear and resonant.

"Are you holding a seance this evening?" asked my companion.

"I shall be happy to give one. But I am afraid there will only be you two, gentlemen, to attend. My clients are mostly old folks and it would be a hardship for them to venture forth into this sort of weather."

From her talk I could readily see that this creole had been well educated and was not the usual type of medium I have so frequently come in contact with during my investigations.

We both were ushered into the seance room by the medium, who kept the conversation in prosaic channels.

Seating ourselves on either side of a plain table standing in the center of the room, the lights in the room of their own accord, grew dim. The medium seated herself across the room in a corner facing us.

We were requested to place our hands at the extreme corners of the table and the soles of our feet flat on the carpet beneath us, as far apart as convenience would allow.

(*Continued on page* 571)

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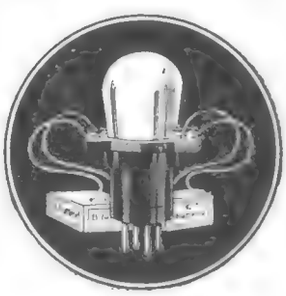

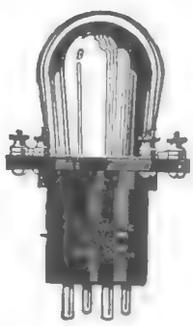

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Likes and Dislikes of the Radio Audience

By CHARLES D. ISAACSON

(*Continued from page* 524)

Perhaps he was right, that people would pay for the privilege of keeping something off the air. It is like the old song "Johnny Morgan plays the organ, his sister plays the drum, with a tum tum di dum. Oh the music is so sweet—people give them a penny to keep in another street." Whether a penny or the millions, who can tell? But the only way we, who are running programs, know what you want, is to learn from you.

LETTERS FROM WRNY FANS

At WRNY we do get a tremendous amount of mail from people, who grow extremely enthusiastic about one thing or another, but everybody doesn't take the trouble to sit down to comment on everything which is liked, or anything which isn't. That is human nature.

Of course, we do have ways of learning much from our listeners. For instance, when WRNY took the momentous step of changing its wavelength to 374.8 meters, we didn't need to ask. We received. Every one of our dozen telephone lines was clogged all day long by fans who congratulated us—and some very few who didn't; I think the complaints came about in the ratio of one to two hundred congratulations. Then in poured the mail, more than *three thousand* letters the very first week. Isn't that wonderful?

AN APPRECIATED FEATURE

Then, when the Edison German Hour program went on, the letters averaged *one hundred and fifty* a day for that feature alone. No doubt you have been following the summer concert course of the Edison Hour, taking you on a musical tour of all nations. By the time this reaches you, of course, that will be long past, and a new series of importance will be delighting you, as the Edison Ensemble bring it to you.

The month just passed has been particularly momentous. It marked the tieup of WRNY with Station WMAF of South Dartmouth, Mass. That powerful station, which operates on 440.9 meters, is owned by the millionaire philanthropist, Colonel E. H. R. Greene, and is reputed one of the greatest distance-achievers in the world. Every Tuesday and Thursday now you can hear WRNY programs on either wavelength.

HOW AN ORCHESTRA IS MADE UP

Before I give you a rapid-fire resumé of the month's high spots, I will give you a little story of popular education in music. So I will tell you something about an orchestra, and the individual members of the family you hear in a concert, whether over the air or in a hall.

The average concert orchestra has these sections:

Strings;
Wood wind;
Brass;
Percussion.

The conductor with his baton gives the beat of the time, the spirit, and the whole direction to the meaning of the phrases. He is the soul of the orchestra; and a great conductor can make any body of *good* musicians into *master* musicians. A musician who merely beats time is not a real conductor.

The string section consists of the violins, violas, 'cellos and bass violins. The violins divide into firsts and seconds. At the first desk of the first violins is the concertmaster,

(*Continued on page* 540)

PRICES CUT

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For a limited time only, genuine World Storage Batteries can be gotten at actual cost. Every cent of profit has been cut out in order to keep our full factory organization busy during the slack season. Prices below are lowest in history.

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JOHNSON SMITH & CO., Dept. 364, Racine, Wis.

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SEX INDICATOR

Hold the **MAGIC INDICATOR** over a man's hand instantly it moves in a manner entirely different than when held over a woman's hand and so with animals. The same with a woman, etc. It is fascinating, baffling. We have received hundreds of letters about how it does—but we never seen it fail. Many other interesting tests can be performed with the Sex Indicator. Pigeons can also be obtained with animals, cats, dogs, rabbits, etc. Also, used to predetermine the sex of chickens, but the fact it is sold as a **guaranteed egg tester in Europe. Price 25c, or 3 for 65c, postpaid.**

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Price $1.00 Postpaid

This very [illegible] made and effective [illegible] is modelled on the latest type of Revolver the [illegible] Cartridges [illegible] which [illegible] sounds [illegible] enough to scare a burglar, whilst when used at [illegible] will probably prove just as effective as a real revolver with its [illegible] but with the danger [illegible] is absolutely [illegible] standard Blank Cartridges that can be [illegible] anywhere. Even the most timid [illegible] can use it with perfect safety and frighten a thief without risk to herself or anyone else. **A Great Protection Against Burglars, Tramps and Dogs.** You can have shooting out with [illegible] the danger attached to other revolvers. We sell more [illegible] hers around the 4th of July. Well made of solid Metal. **PRICE ONLY $1.00 Postpaid. Blank Cartridges 22-calibre** shipped by express only, **50c per 100. Johnson Smith & Co., Dept. 364, Racine, Wis.**

Sneezing Powder

Place a very small amount of the powder on the back of your hand and blow it into the air and everyone in the room or car will begin to sneeze without knowing the reason why. It is most amusing to hear their remarks, as they never suspect the real source, but think they have caught it one from the other. Between the laughing and sneezing you yourself will be having the time of your life. For parties, political meetings, car rides, or any place at all where there is a gathering of people, it is the **greatest joke out. Price 10c or 3 for 25c**

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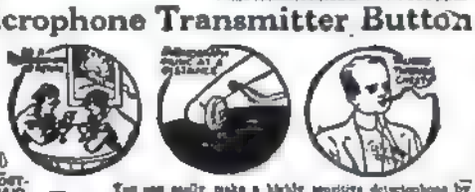
A painted figure of a skeleton that is brought will dance to music and perform various gyrations and movements which the operator may be some distance from it.

Serpent's Eggs

Box contains 12 eggs. When lit with a match each one gradually but begins to swell itself into a snake several feet long which curls and twists about in a most lifelike manner. **Price 5c per box 10c post.**

Microphone Transmitter Button



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You can easily make a highly sensitive detectophone by using this Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can connect up different rooms of a hotel. This outfit was used by secret service operatives during the war. It is being used by crooks right now. It is above-ground and is the greatest invention in micro-phones. You can mount the button almost anywhere—under a chair, desk, table, bed, behind a picture frame, etc. Then it is out of sight and small it cannot be detected. Persons can be overheard without suspecting it. You can listen in on conversations in another room. A deaf person in the audience can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be heard [illegible] of feet away. Button may be used to record talks, one transmitter often makes an old line "talk-up" to nothing else will. The ideal microphone for radio use carries heavy current and is extremely sensitive. Amateurs radio signals. Countless other almost [illegible] will suggest themselves. Experimenters find the Button useful for hundreds of experiments along the lines of telephones, amplifiers, loud speakers etc. Many fascinating stunts may be devised such as holding the button against the throat so as to reproduce speech without sound waves. $5.00 is given to any one who made up a new suggestion for the use of the Button providing the manufacturers find it available for use in their business. **PRICE $1.00 POSTPAID ANYWHERE.**

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One of these glass vials dropped in a room full of people will cause more consternation than a limburger cheese. The odor entirely disappears in a short time. **10c a Box, 3 Boxes for 25c**

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This is another good practical joke, the intense discomfiture of your victims to [illegible] that [illegible] is unnecessary to explain the ball of fun to [illegible] just a little of the powder on a person's hand and the powder can be relied upon to do the rest. The result is a scratch, scratch then some more scratch and [illegible] more. **10c** box, **3** boxes for **25c** or **75c** per doz. [illegible] postpaid.

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3 for $1.00

Wonderful Instrument [illegible] greatest thing yet [illegible] a pocket size [illegible] of pleasure [illegible] very useful [illegible] Microscope for examining [illegible] Reading Glass [illegible] Mirror and a Burning Glass [illegible] for examining [illegible] to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail, postpaid. Price, only **35c** or **3** for **$1.00** postpaid.

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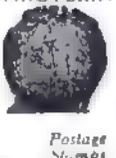

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Likes and Dislikes of the Radio Audience

(*Continued from page* 538)

who is the chief man of the orchestra under the conductor. He is assistant to the conductor and speaks for the men. He gives definition to the bowing and phrasing and fingering; and in an orchestra, where there are as many as forty violins, you can realize the importance of this.

The violas are to the violins as the baritone is to the tenor, or the contralto to the soprano. The viola is played in the same manner as the violin, but the tone is five notes lower and more mellow.

The 'cello is played between the knees of the artist. It is to the violin as the bass is to the tenor. The viola, 'cello and the bass violins are the foundation of the string section. The bass violins are those big violins played by the artist, when he tries to reach up to the top.

THE WIND INSTRUMENTS

Now comes the wood wind section, called that in spite of the fact that often the instruments are not of wood.

The flute and piccolo are held parallel with the lips, and the air is sent at right angles to the instruments.

Now in the brass, we have the trumpet, the slide trombone which all recognize.

Now for the percussion. That includes drums, tympani (another form of drum of hemispherical shape), the triangle, bells and all the traps. They make the noises, thunder, etc. Of course every good orchestra also adds the harp for special effect, and sometimes the xylophone and other instruments on occasions.

Now you have a panorama of the orchestra formation.

A MONTH'S FEATURES AT WRNY

During the past month at WRNY we put on the first exclusive radio prize fight, between Jimmy Rappaport and Bennie Martini, with that old veteran Jimmy Macdonald refereeing the bantams. The event was staged by Starlight Park. Also, we had a real swimming contest at WRNY. Do you wonder how it was done? Look at the picture of the girls. One of them was the Comtesse du Barry.

For the Fourth we reproduced the actual events at the Congress in 1776 when the Declaration was signed. The voices of John Hancock, John Adams, Thomas Jefferson and the rest spoke up in the way they did in the historic days.

During the past month Louise Closser Hale and Olive Wyndham were heard in an Edison Hour prize play. One of the most beautiful musical events ever radioed began this month at WRNY with the A. Y. Cornell Opera Company. Such voices! Fresh, beautiful and dramatic. And at the piano was the distinguished pianist composer Charles Gilbert Spross.

As dramatic as anything I have ever heard was the speech of Commander Edward Ellsberg, who raised the submarine S-51. He told just how it was done; and we were all weeping, when we weren't so tense we could scarcely breathe. Commander Ellsberg is a real literary man and quite an orator.

Did you hear us the night we brought Punch and Judy back to the kiddies?

Have you been listening to my family concert parties on Wednesday nights?

I hope you are getting acquainted with my Bohemian child, Josefa Chekova, and my Italian boy, Alberto Terrasi, and my American-Irish infant, J. Milton Bevan, and my Spanish youngster, Alfonso Romero, and all the rest of that merry family.

See you again next month.

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Edited By
Joseph H. Kraus

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

CAPLESS FOUNTAIN PEN

(963) D. S. Elgin, N. S. Pittsburgh, Pa., says he has designed a fountain pen requiring no cap and which is instantaneously ready for use.

A. If a pen of the type described in your letter can be made so as to be practical and so as to operate every time that the user desires it to, it should certainly find a ready sale. However, we cannot comment further upon the system unless you desire to supply us with complete details.

IDEA PROTECTION

(964) Henry Blume, New York, N. Y., wants to protect his idea of a perpetual motion machine before having a model made and asks us what he should do.

A. The simplest way to protect yourself would be by making up an evidence of conception which consists of drawing up a complete set of designs and specifications covering the device and having each sheet signed, sealed and dated by a notary public and before two witnesses. This establishes a claim of priority. The evidence is for your own files and only to be used in case of necessity for prosecuting infringers.

COLLAR BUTTON

(965) John Becker, Warren, Idaho, has been granted a patent on a collar button made in the form of a hinge-like structure which is placed on the shirt band and then clamped under and around the collar. He has been unable to sell the idea on a royalty basis and asks us if he should go into the manufacture of the product.

A. You have probably discovered by this time that it will be difficult for you to place your idea on the market. The reason for this is quite obvious. There are entirely too many operations which must take place in order to fasten the collar to the short and the only apparent advantage is that it does not distort the button-hole tab of a collar. This advantage is slight and probably questionable. A collar fastener should in all cases be speedy in insertion; it should make it easier for the collar to be placed on the collar-band rather than make it more difficult. The less metal that touches the neck, the better that collar fastener. In your device the hinge is bound to irritate the neck; a good portion of the metal touches the neck constantly. The clasp must first be fitted down over the shirt band and then must be raised upon the collar itself after the collar has been located over the button.

We certainly would not suggest that you go to the expense of having the dies made for this particular device or try to sell the marketed article. If there is any possible way of selling the invention, we would suggest that you do so, otherwise it would seem to us that the idea is a dead issue and could not possibly find a favorable market.

We do not think that $450 is too much for the dies. A small die averages about $200 and you will need more than one to make the finished article.

CHAIN FASTENER

(966) Alex Barna, Belle Mead, N. J., asks our opinion of a log cabin fastener of seemingly conventional design.

A. We do not see any advantage whatsoever in your particular type of chain fastener. It does not appear to be any simpler or to have any advantages over the types of chain fasteners in use today. Possibly you could obtain a patent on your particular suggestion, but even at that, we are very much of the opinion that such a patent would not be at all valuable. We would, therefore, not advise you to invest any more time or money in the prosecution of this idea.

TO SUE OR NOT TO SUE

(967) O. S. Whitehurst, Gloucester, N. C., claims that a certain concern has stolen his invention of a two-filament electric lamp and wonders what he can do about it.

A. If you can prove that the concern now manufacturing the two-filament electric light bulb actually infringed on your idea you can probably sue that concern.

You state merely that you have ample proof that you are the inventor thereof. That proof would have to consist in having built a working model of the device before it was actually patented by the concern now making the same.

Two-filament lights are old and have been known for a great many years. The main invention is the switching mechanism enabling the individual to operate either one filament or the other as desired.

RADIATOR SIGNAL

(968) G. H. Wenn, New York, N. Y., asks our opinion of a semaphore signal to indicate if the water in the radiator of a gas engine is too hot.

A. In regard to the Stop and Go sign, or a semaphore, to indicate when the radiator of an automobile is too hot or cold, we would suggest that you look at the radiator caps of some of the automobiles in New York and you will find that the identical system is now in use.

This article may be purchased in any of the larger automobile supply stores.

COOKIE CUTTER

(969) William Atherton, Ford City, Ontario, Canada, has designed a unique cookie cutter which rolls along as it cuts. He asks our opinion of the system.

A. It would seem that you have a rather clever little device for cutting dough. If the device could be properly financed and promoted, you should have no trouble in selling it through the medium of department and household furnishing stores. However, a device of this nature will not prove profitable to you unless you can manufacture it on a large scale or sell the rights to the idea. This could probably be done without applying for a patent and consequently you would save just that much money. Protect yourself by means of an evidence of conception which consists of drawing up a complete set of designs and specifications covering the device and having each sheet signed, sealed and dated by a notary public and before two witnesses. This evidence is for your own files and only to be used in case of necessity for prosecuting infringers.

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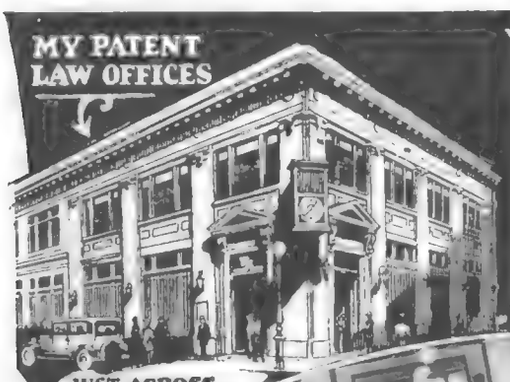

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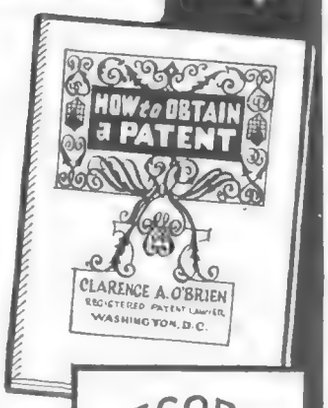

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Into the Fourth Dimension

By RAY CUMMINGS

(*Continued from page* 505)

us, to enter perhaps into a frustration of our plans, with which my imagination now endowed its purpose, made me read into its attitude a tenseness of line; an alertness, even a guarded wariness which had not seemed inherent to it before. Was this thing indeed aware of our purpose? Was it waiting for Wilton Grant to come into the shadows to meet it upon its own ground? With an equality of contact, was it then planning to set upon him?

Bee was murmuring, "It's waiting for you. Will, it's waiting for you to come——" Shuddering words of apprehension, of which abruptly she seemed ashamed for she checked them, going to the table where she began adjusting the apparatus.

"I'm coming," said Will grimly. "It will do well to wait, for I shall be with it presently." He stood for a moment before the thing, contemplating it silently. Then he turned away, turned his back to it; and a new briskness came to his manner.

"Rob, I'm ready. Bee knows exactly

"Wilton's eyes were closed. They opened now, and his arm and hand with a wraith-like quality come upon them, were raised to a gesture. The signal. I would have stammered so to Bee, but already she had marked it and shut the current off. And very quietly, unhurried, she bent over and disconnected the wires, casting them aside.

what we are to do. I want you to know also, for upon the actions of you two, in a measure depends my life. I shall sit here on the mattress. Perhaps, if I am more distressed than I anticipate, I shall lie down. Bee will have charge of the current. There will come a point in my—departure when you must turn off the current, disconnect the wires from me. If I am able, I will tell you, or sign to you when that point is reached. If not—well then you, must use your own judgement."

"But I—I have no idea—" I stammered. Suddenly I was trembling. The responsibility thrust thus upon me seemed at that moment unbearable.

"Bee has," he interrupted quietly. "In general I should say you must disconnect when I have reached the point where I am —" He halted as though in doubt how to phrase it—"the point where I am half substance, half shadow."

To my mind came a mental picture which then seemed very horrible; but resolutely I put it from me.

"You're ready, Bee?" he asked.

"Quite ready, Will." She was counting

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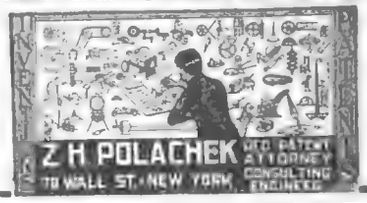

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out a number of the tiny pellets with hands untrembling. The woman in Bee was put aside; she stood there a scientist's assistant, cool, precise, efficient.

"I think I should like less light," he said; and he turned off all the globes but one. It left the room in a flat, dull illumination. He took a last glance around. The window sashes were up, but the shades were lowered. A gentle breeze from outside fluttered one of them a trifle. Across the room the spectre, brighter now, stood immobile. The clock marked one minute of ten.

"Good," said Will. He seated himself cross-legged in the center of the mattress. In an agony of confusion and helplessness I stood watching while Bee attached the four wires to the garment he wore. One on each of his upper arms, and about his thighs where the short trunks ended.

Again I stammered, "Will, is this—is this all you're going to tell us?"

He nodded. "All there is of importance . . . A little tighter, Bee. That's it—we must have a good contact."

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When SCIENCE AND INVENTION Magazine was still in its infancy, the editors denied the possibility of constructing a perpetual motion machine using those forces of nature as we now know them.

Since that time the editors have received thousands of different designs for perpetual motion devices, and have received hundreds of circular letters soliciting finances for the building of perpetual motion machines.

The editors know that if they receive these letters, there are thousands of others in this country who get similar letters and who fall for the claims made in the numerous prospectuses giving the earning capacities of the various machines.

Most of the shares of stock for these perpetual motion machines are being sold at a rate of $1.00 per share, although some inventors are trying to sell shares of stock at $100.00 per share.

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"I mean," I persisted, "when you are—are shadow, will we be able to see you?"

He gestured. "As you can see that thing over there, yes."

His very words seemed unavoidably horrid. Soon he would be—a thing, no more.

"Shall you stay here, Will, where we can see you?"

He answered very soberly, "I do not know. That, and many other things, I do not know. I will do my best to meet what comes."

"But you'll come back here—here to this room, I mean?"

"Yes—that is my intention. You are to wait here, in those chairs. One of you always awake, you understand—for I will need you, in the coming back."

There seemed nothing else I would ask, and at last the moment had come. Bee handed him the pellets, and held the glass of water. For one brief instant I had the sense that he hesitated, as though here upon the brink the human fear that lies inherent to every mortal must have rushed forth to stay his hand. But an instant only, for calmly he placed the pellets in his mouth and washed them down with the water.

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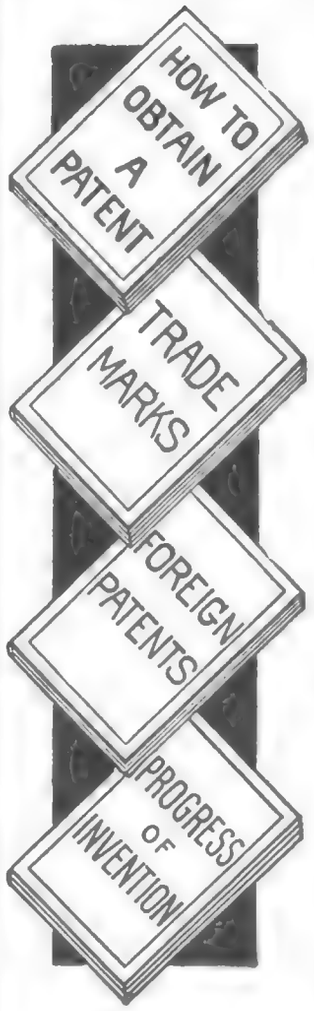

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"Now—the current, Bee."

His voice had not changed; but a moment after I saw him steady himself against the mattress with his hands; momentarily his eyes closed as though with a rush of giddiness, but then they opened and he smiled at me while anxiously I bent over him.

"All right—Rob." He seemed breathless. "I think—I shall lie down." He stretched himself at full length on his back; and with a surge of apprehension I knelt beside him. I saw Bee throw on the little switch. She stood beside the table, and her hand remained upon the switch. Her face was pale, but impassive of expression. Her gaze was on her brother and I think I have never seen such an alert steadiness as marked it.

A moment passed. The current was on, but I remarked unmistakably that no sound came from it. The room indeed had fallen into an oppressive hush. The flapping shades momentarily had stilled. Only the clock gave sound, like the hurried thumping of some giant heart, itself of all in the room most alive.

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Wilton Grant lay quiet. His eyes were fixed on the ceiling; he had gone a trifle pale and moisture was on his forehead, but his breathing, though faster, was unlabored.

I could not keep silent. "You—all right, Will."

At once his gaze swung to me. A smile to reassure me plucked at his parted lips. "All—right, yes." His voice a half-whisper, not stressed, almost normal; and yet it seemed to me then that a thinness had come to it.

Another moment. The putty-colored garment he wore had lost the vague sheen of its reflected light and was glowing with an illumination now inherent to it. A silver glow, bright like polished metal; then with a greenish cast as though phosphorescent. And then, did I fancy that its light, not upon it or within it, but behind it, showed the garment turning translucent?

I became aware now of a vague humming. An infinitely tiny sound—a throbbing hum fast as the wings of a humming bird, near at hand, very clear, yet infinitely tiny. The battery—the current; and yet in a moment with a leaping of my heart, I knew it was not the current but a humming vibration

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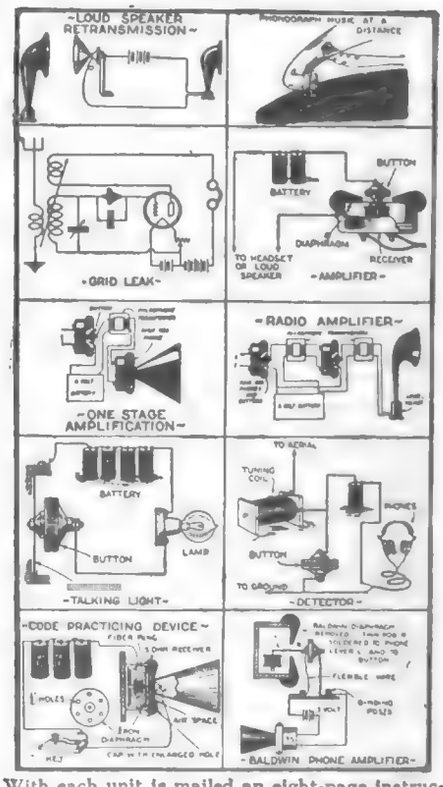

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from the body of Wilton Grant. A sense of revulsion, a fear—I have no memory adequately to name it—swept me. I rose hastily to my feet; as though to put a greater distance between us I moved backward, came upon a leather easy chair, sank into it, staring affrighted, fascinated at the body recumbent before me.

The change was upon it. A glow had come to the ruddy pink flesh of the arms and legs, bared chest, throat and face. The pink was fading, replaced, not by the white pallor of bloodlessness but by a glow of silver. A mere sheen at first; but it grew into a dissolving glow seeming progressively to substitute light for the solidity of human flesh.

And then I gasped, My breath stopped. For behind that glowing, impassive face I saw the solid outlines of the mattress taking form, saw the mattress through the face, the chest, the body lying upon it.

Wilton's eyes were closed. They opened now, and his arm and hand with a wraith-like quality come upon them, were raised to a gesture. The signal. I would have stammered so to Bee, but already she had marked it and shut the current off. And very quietly, unhurried, she bent over and disconnected the wires, casting them aside.

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The humming continued; so faint, so rapid I might have fancied it was a weakness within my own ears. And presently it ceased.

Bee sat in the chair beside me. The body on the mattress was more than translucent now; transparent so that all the little tufts of the mattress-covering upon which it lay were more solidly visible than anything of the shadowy figure lying there. A shadow now; abruptly to my thought it was Wilton Grant no longer.

And then it moved. No single part of it; as a whole it sank gently downward, through the mattress, the floor, until a foot or so beneath, it came to rest. With realization my gaze turned across the room. The silent spectre was still there, standing beneath the floor, standing I realized, upon the same lower level where the shadow of Wilton Grant now was resting.

I turned back, saw Bee sitting beside me with white face staring at the mattress; and I heard myself murmur. "Is he all right do you think? He hasn't moved. Shouldn't he move? It's over now, isn't it?"

She did not answer. And then this wraith of Will did move. It seemed slowly to sit up; and then it was upright, wavering. I stared. Could I see the face of my friend? Could I mark this for the shadow of his

(*Continued on page* 548)

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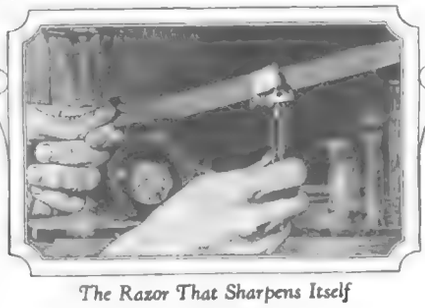

The Razor That Sharpens Itself

Into the Fourth Dimension

(*Continued from page 547*)

familiar figure, garbed in that woven suit? It seemed so. And yet I think now that I was merely picturing my memory of him; for surely this thing wavering then before me was as formless, as indefinable, as elusive of detail as that other, hostile spectre across the room.

Hostile! It stood there, and then it too was moving. It seemed to sweep sidewise, then backward. Ah, backward! A triumph came to me that perhaps now a fear lay upon it. Backward, floating, walking or running I could not have told. But backward, beyond the walls, the house, smaller into the dimness of distance.

Was the shadow of Wilton Grant following it? I could not have said so. But it too, was now beyond the room. Moving away, growing smaller, dimmer until at last I realized that I no longer saw it.

We were alone Bee and I; alone to wait. The mattress at my feet was empty. I heard a sound. I turned. In the leather chair beside me Bee was sobbing softly to herself.

CHAPTER IV

THE RETURN

THE hours seemed very long. A singular desire for silence had fallen upon us. For myself, and it is my thought that the same emotion lay upon Bee, there were a myriad questions upon which idly I would have spoken. Yet of themselves so horrible, so fearsome seemed their import that to voice them would have been frightening beyond endurance.

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Thus, we did not speak; save that at first I comforted Bee, clumsily as best I could, until at last she was calmer, smiling at me bravely, suggesting perhaps that I would sleep while she remained on watch.

The clock ticked off its measured passing of the minutes. An hour. Then midnight. The window shade was flapping again with the night wind outside. I rose to close the sash, but Bee checked me.

"He might want to come in that way. You understand, Rob——"

Memory came to me of the half-materialized spectre of that Kansas farmhouse, that apparition so ponderable of substance that it must perforce escape by the opened window. I turned back to my chair.

"Of course, Bee. I had forgotten."

We spoke in hushed tones, as though unseen presences not to be disturbed were around us. Another hour. Throughout it all with half closed eyes I lay back at physical ease in my chair, regarding the white walls of our little room so empty. We still kept the single dull light; dull, but it was enough to illumine the solid floor, that starkly empty mattress, the white ceiling, the four walls, closed door at my side, the two windows, one of gently flapping shade. And as musingly I stared, the sense of how constricted was my vision grew upon me. I could see a few feet to one blank

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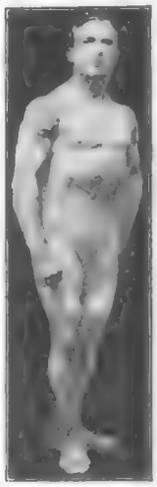

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wall or another, or to the ceiling above, the floor below, but no further. Yet awhile ago, following the retreat of those white apparitions, my sight had penetrated beyond the narrow confines of this room into distances illimitable. And to me then came a vague conception of the vast mystery that lay unseen about us, unseen until peopled by things visible to which our sight might cling.

The realm of unthought things! Yet now I was struggling to think them. The realm of things unseen. Yet I had seen of them some little part. The wonder came to me then, were not perchance, unthought things non-existent until some mind had thought them, thus to bring them into being?

Two o'clock. Then three. Five hours. He had said he might return in five hours. I stirred in my chair, and at once Bee moved to regard me.

"He will be coming, soon," I said softly. "It is five hours, Bee."

"Yes, he will be coming soon," she answered.

Coming soon! Again I strove with tired eyes to strain my vision through those solid walls. He would be coming soon; I would see him, far in the distance which his very presence would open up to me. Then—an

Bee's agonized call rang out. "Will! Is this you, Will?" We stood together; she clung to me. The figure advanced, stood now quite within our walls. No longer wholly spectral, a cast of green had come to it; a first faint semblance of solidity. It stood motionless; drooping, as though tired and spent. Was it Wilton Grant?

hour later, or nearly—I thought I saw him, but it was a glint of light on a tiny nailhead buried in the wall.

And then I saw him! Straight before us. Beyond the wall, with unfathomable distances of emptiness around him. It might have been our light gleaming upon an unnoticed protuberance of the rough plaster of the wall, so small was it; but it was not, for it moved, grew larger, probably coming toward us.

Bee saw it. "He's there! See him, Rob!" Relief in her tone, so full to make it almost tearful; but apprehension as well, for to her as to me came the knowledge that it might not be he.

Breathless we watched; waited; and the white luminosity came forward. Larger, taking form until we both could swear it was the figure of a man. Lower now, beneath the level of our floor. It came, stopped before us almost within the confines of the room.

We were on our feet. Was it Wilton Grant? Was this his tall, spare figure—this luminous, elusive white shape at which I gaped? Did I see his shaggy hair? Was that his brief woven garment? I prayed that my imagination might not be tricking me.

Bee's agonized call rang out. "Will! Is this you, Will?"

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We stood together; she clung to me. The figure advanced, stood now quite within our walls. No longer wholly spectral, a cast of green had come to it; a first faint semblance of solidity. It stood motionless; drooping, as though tired and spent. Was it Wilton Grant? It moved again. It advanced, sank into the floor as though sitting down—sitting almost in the center of the mattress, though a foot beneath it. Significant posture! It had come to the mattress from whence it had departed. It *was* Wilton Grant!

We bent down. Bee was on her knees. Now we could see details, clearly now beyond all possibility of error. Will's drawn face, haggard, with the luminosity every moment fading from it, the lines of opaque human flesh progressively taking form.

He was sitting upright, his hands bracing him against that unseen level below us. Then one of his hands came up, queerly as though he were dragging it, and rested on the higher level of the mattress. His eyes, still strangely luminous, were imploring us. And then his voice; a gasp; and a tone thin as air.

"Raise—me! Lift—me up!"

Bee's cry was a horror of self-reproach, and I knew then that she must have neglected the instructions he had given her. We touched him; gripped him gently. Beneath my fingers his half ponderable flesh seemed to melt so that I scarce dared press against it. We raised him. There was little weight to resist us; but as we held him, the weight grew. Progressively more rapidly; and within my fingers I could feel the blessed solidity coming.

Again he gasped, and now in a voice of human labored accents. "Put me—down. Now—try it, Bee."

We lowered him. The mattress held him. At once he sank back to full length, exhausted, distressed—but uninjured. Bee gave him a restorative to drink. He took it gratefully; and now, quite of human aspect one more, he lay quiet, resting.

Bee's arms went down to him. "Oh Will—to have you back again—safe with us—you must go to sleep now—then you can tell us——"

"Sleep!" He sat up so abruptly it was startling; more strength had already come to him than I had realized. "Sleep!" He mocked the word; his gaze with feverish intensity alternated between us.

"Bee—Rob, this is no time for talk . . . No, I'm all right—quite recovered. Listen to me, both of you.. What I have been through—seen, felt—you could never understand unless you experienced it. No time for talk—I must go back!"

A wildness had come to him, but I could see that he was wholly rational for all that; a wildness, born of the ordeal through which he had passed.

"I must go back, at once. The danger impending to our world here—is real—far worse than we had feared. Impending momentarily—I had feared it—but now I know. And I must go back. With you—I want you two with me. You'll go, Bee. Rob, will you go? Will you, Rob?"

A sudden calmness had fallen upon Bee. "I'll go of course," she said quietly.

"Yes, of course. And you, Rob? Will you go with us? We need you."

Would I go? Into the unnameable, the shadows of unthought, unseen realms, to encounter—what? A rush of human fear surged over me; a trembling; a revulsion; a desire to escape, to ward off this horror crowded thus upon me. Would I go? I heard my own voice say strangely:

"Why—why yes, Will, I'll go."

Go! Leave this world!

And my voice was telling them calmly that I would go!

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Simple High Temperature Furnaces

By WILLIAM CAPUNE

(*Continued from page* 520)

two small holes, and reamed out in a long taper as shown. The other connections are best made by fitting a short section of metal tubing tightly into the holes in the mixing valve and connecting them to the gas and air sources with rubber tubing.

For safety's sake a hydraulic valve similar to that in Fig. 2 should be connected in the gas feed line. It consists merely of a tin can half filled with water, having two tubes soldered in its sides. The gas has to bubble through the water to secure exit to the furnace line and this water prevents the gas from burning back in the tube in case the pressure should drop. The air can be under almost any pressure, and almost any source is suitable: bellows, pump, tanks, blowers, or what not. If the experimenter sets out to make a motor-driven pump let me warn him to make the pump of large bore and stroke, particularly the bore.

To operate the furnace the gas is turned on, letting it run for a few moments until the air in the tubing has been blown out. The gas is then lighted and the air turned on gradually until an almost transparent blue flame with a dark blue center is secured. Crucibles placed in the focus of the ring of burning jets will be raised to temperatures high enough for the production of the alloys given at the end of this article.

For temperatures just a trifle lower than those given by this gas furnace an unusual type of alcohol burner is shown in Fig. 3. It depends on the idea of vaporizing the alcohol and mixing with air under pressure, thus securing a higher temperature and efficiency. Two tripods of different heights are mounted on a base, for convenience in moving about. On this same base, at one side, is made, in any fashion, a platform the height of the lower tripod. This supports the alcohol reservoir. The mixing valve for this burner may be the same as that described for the first case, but the wood should be soaked in varnish since alcohol will dissolve shellac. The valve is hung between the legs of the tripods as shown. A far better valve can be made by joining glass tubing into the same general form and size as the passages of the wooden model. In addition, a small vertical hole is drilled at A., running into the junction of the three internal tubes. When not being used this new hole should be plugged with a cork.

A tube leads from the alcohol reservoir, having a stopcock at the joint with the can, and, just past the stopcock, a wad of cotton string or a small piece of sponge wedged into the tube. This is to allow the passage of alcohol without an actual flow since the latter would send the alcohol spouting out of the burner holes. The tube from the alcohol reservoir leads around in a loop raised just off the lower tripod. The mixing valve connects with the other end, the port used for gas in Fig. 1 being connected to this tube. This tube has no burner holes in it; its sole purpose is to be heated by the burner tube, vaporizing the liquid alcohol within. The mixture port of the mixing valve is connected to another loop of tubing just outside the first, and which is placed on the surface of a sheet of screening covering the platform of the lower tripod. The other end of this loop is stopped up, the tube itself being pierced as was the case in the first furnace. These holes should be placed so that the jets of flame will point toward the tripod platform immediately above, the jets just passing by the vaporizing tube.

A hydraulic valve cannot be used with this alcohol burner since the vapor would be con-

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densed to a liquid by its passage through the water. For this reason the alcohol reservoir should have a tight fitting lid pierced by only one small hole. Thus, if the alcohol vapor should burn back due to a fall in the air pressure or any other reason, the alcohol in the can would not burn because of lack of air.

In starting this burner a little alcohol is poured into the auxiliary tube A of the mixing valve and runs down into the burner where it can be lighted after waiting a moment to allow it to vaporize. The burning of this alcohol heats the other tube which contains alcohol, vaporing the latter, which, flowing into the mixing valve, is mixed with air and blown into the burner tube. The object to be heated is placed on the screening across the upper tripod. Though most reactions that can be secured with the gas furnace are possible with this type of burner the cost is greater and the efficiency in heating operations extending over longer periods of time is much lower, due to radiation of heat into the surrounding air. The temperature attainable is about 3,000 degrees Fahrenheit.

The king of all laboratory furnaces is the acetylene furnace shown in Fig. 4. A temperature of over 4,500 degrees Fahrenheit is easily attainable with this type; in addition it is very cheap in operation and requires no piping for gas in the lab.

The furnace proper is shown in Fig. 4. Two blocks, A and B, are made or cast in the shape shown, the lower one having the two-burner tubes cast in it. Each tube is in the shape of a U with one branch lying along the bottom of the hollow in the lower block, B. The other end of each is plugged up and the usual holes are pierced in each, so that the jets of flame will point toward the center line lengthwise of the cavity. Stopcocks in both the air and gas pipes at the entrance to the mixing valve are necessary.

An acetylene gas generator is also necessary and may be made, or purchased very reasonably. A simple generator is shown in Fig. 5: the carbide is placed in the bottom of a large can and water, from a tube above having a stopcock in it, drips into the can. The reaction produces acetylene which is conducted through tubing to the reservoir shown in Fig. 6. After having experimented with all kinds of expansible reservoirs for maintaining an even pressure the writer has found the one shown to be the best of the simple types. A large coffee can is fitted with a ¼" tube at the base which is connected with a long piece of glass tubing of the same size by a section of rubber hose. The longer the glass tubing the better. A little salt water is put in the bottom of the can and the gas enters at A, leaving at B. The pressure of the gas forces the water out into the tube, the height in the tube increasing with the pressure. Thus, the water in the glass tube forms only a gauge indicating the pressure and amount of gas in the tube and actually governs it to a certain extent, by the weight of its column. Hence the advantage of a long tube. A pressure of about 0.5 pound per square inch is exerted in the can by a column of strong salt solution twelve inches high. A larger tube does not increase the pressure for the same length of tubing. The entrance at A has a flap valve of thin, oiled leather which prevents the pressure from being taken back in the generator.

From B the gas is led through a hydraulic valve, filled in this case with brine, in which acetylene is only slightly soluble. From the hydraulic valve it goes into the mixing valve through the port which was marked "Gas" in Fig. 1.

To light this furnace the gas generator is started and the reservoir raised to its maximum pressure (from two to four pounds is excellent). If a higher pressure is desired and a higher air pressure is available the upper end of the glass tube may be closed

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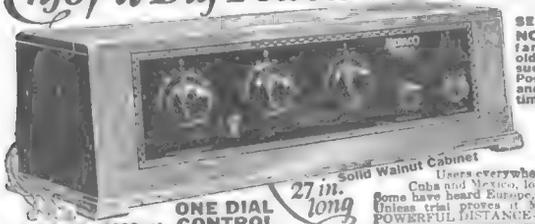

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instead of being allowed to remain open. Thus, when the liquid rises in the tube it must compress the air above. In this case the pressure of the liquid column is equal to the value given for the open tube plus the pressure of the compressed air. This latter pressure is twice its ordinary pressure when the liquid half fills the tube, four times its ordinary pressure when the liquid has compressed the gas to a quarter its original volume, and so on.

When the pressure in the reservoir is maximum the gas is turned on and allowed to run a few seconds to clear the pipes of air and then lighted. When lighted the air pressure is gradually turned on until a flame that is nearly all transparent blue with a small bright blue central cone is produced. Too much air makes this cone larger, irregular in shape, and jerky; too much acetylene makes the large part of the flame bluer and more luminous, which is to be avoided.

Many remarkable things may be accomplished in the line of metallurgy, particularly with the illuminating and acetylene gas furnaces. Even platinum can be melted easily. An excessively hard and brittle iron that can scarcely be affected by a file can be produced by heating ordinary nails with powdered charcoal. When the mixture has been at the melting point for about half an hour it should be stirred well and then poured into a mold and cooled quickly, or poured into a water bath. The sudden cooling will produce a glass-hard surface. A very soft steel can be made from any cheap iron, such as nails, by blowing air into the molten iron in the crucible. The oxygen of the air will burn out the carbon which gives iron its hardness, and when cooled slowly it is even softer yet.

Statues, book ends, paper weights, and similar objects can be cast in such beautiful alloys as gunmetal, which is about 10% tin and the rest copper. By heating each metal separately and then pouring together while cooling a marbled appearance may be produced. The cooling should not be too slow, otherwise the alloy will be weak at the edges of the marbled parts and is likely to crack open.

That remarkable metal "Invar," which does not expand appreciably with changes in temperature, and is therefore used for the pendulums of accurate clocks, is composed of soft steel 65% and nickel 35%. A list of some of the common alloys is given below:

Brass: 70% copper; 30% zinc.

Bell Metal: 80% copper; 20% tin.

High Strength Aluminum: 90% aluminum; 10% copper.

Pewter: lead and tin in almost any proportion.

Fusible metal: 50% bismuth; 25% lead; 25% tin; melts at about 150 degrees Fahrenheit.

Manganese Steel: 15% manganese; rest soft steel. (Easily made by melting up manganese dioxide and nails. Manganese steel retains its temper even at a dull red heat).

Chrome Steel: 2% chromium; 2% carbon; rest soft steel. (Very hard to work with cutting tools; used in making safes).

The reader can easily find many more interesting alloys to try, and there is an immense field for original work. The possibilities of various alloys of even the commoner metals are just beginning to be realized; because 50% carbon produces extreme hardness is not always a guide to what 30% or 75% will produce, besides there will be a variation in the hardness. There is no way of prophesying definitely beforehand what the characteristics of a new alloy will be.

In addition there are many other interesting reactions of a chemical nature which will take place only at high temperatures: iron may be completely burned away if exposed to a steady draft of air while it is molten.

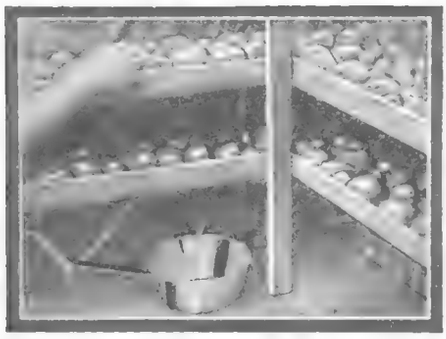
A Winter-Kitchen Garden

By DR. ERNEST BADE

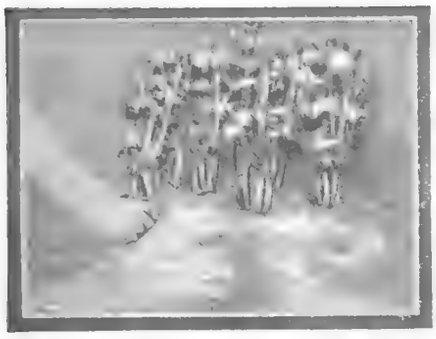
(*Continued from page 497*)

ficient: thyme, rosemary, sage, lavender, balm taragon and mint. Two pots of parsley and chives become necessary when they are to be cut quite often.

These plants do not require an especially warm room, a cool frost-free spot where they are able to receive plenty of light, is quite sufficient for their needs. Should some of these plants die back of their roots, the pots should be placed in a warm window where they will soon sprout. It is in this way, when regularly cared for, that all of the various kitchen herbs may be had fresh throughout the entire winter.



Potatoes placed on frames or shelves in the cellar keep them dry and well ventilated, thus keeping them far longer in a better condition through out the winter.



Celery should be kept in a dry and frost free cellar, the celery being placed upright in sand contained in boxes, or placed in one corner of the cellar.

Another way to keep cabbages for winter use is to place them in a shallow ditch, roots downward, covering them with boards, straw and about a foot of soil.

(*Continued on page 557*)

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Photos of American Radio Artists

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LATEST LIST REVISED WAVE LENGTHS

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(Listed two ways)

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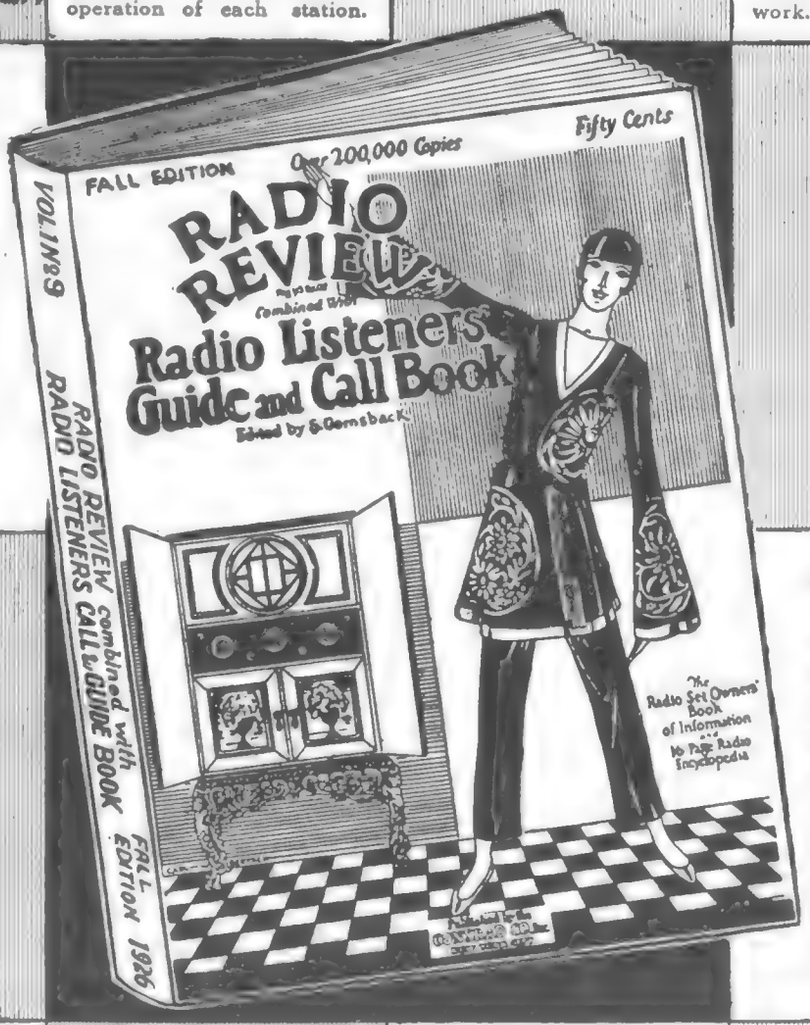
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RADIO REVIEW combined with RADIO LISTENERS CALL & GUIDE BOOK FALL EDITION 1926
The Radio Set Owners' Book of Information and 16 Page Radio Encyclopedia

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A Winter-Kitchen Garden

(*Continued from page* 555)

Kitchen herbs are kept growing all winter by planting in pots and keeping the pots on the window ledge in boxes until frost sets in; then the kitchen garden of herbs is removed to a window where it is protected from the frost.

How Byrd found North Pole

By WILLIAM P. SULLIVAN

(*Continued from page* 492)

The magnetic compass and the earth inductor compass indicate magnetic north and in order to find the time azimuth, the difference between magnetic and true norths, the magnetic declination must be known. This depends entirely upon the observer's geographical position.

The earth inductor compass does away with the usual form of pivoted needle and is the most modern form of aircraft compass. Current is generated in a coil rotated in the earth's magnetic field and it indicates electrically the direction of true north on instruments located in the cockpit. The generator or rotating coil is located at the rear and on top of the fuselage, the power being furnished by a small windmill.

Another form of compass used on this North Pole flight is called the Bumstead Sun Compass. This instrument checks the direction of true north astronomically by setting it with the sun by time methods and is equally accurate.

With such highly developed instruments for locating true positions accurately and speedily one can easily understand how it was possible for Commander Byrd and Floyd Bennett to fly directly to the pole from Spitzbergen, completely check their positions, and return to the exact spot from where they had departed fifteen hours before, with no landmarks to help them, depending entirely upon instruments.

ANENT THE ROWMOBILE

In the August number of SCIENCE AND INVENTION Magazine we featured, both on the cover and in the text pages of the magazine, a new German invention comprising a man propelled automobile, which was originally called the "Landskiff" on the other side of the ocean, but which the editors renamed the "Rowmobile" for American usage. Through a very strange coincidence, we have received a letter from the Row-Mobile Manufacturing Company of Oakland, California, calling our attention to the fact that they are manufacturing a children's vehicle which is propelled by a rowing action and which they call the Rowmobile. They also own the patent right on this device for use on rowboats, life boats, athletic and various other uses. They also own the copyright on the name Rowmobile. The rowmobile which is manufactured by this concern has a selective forward, neutral and reverse transmission with no dead centers.

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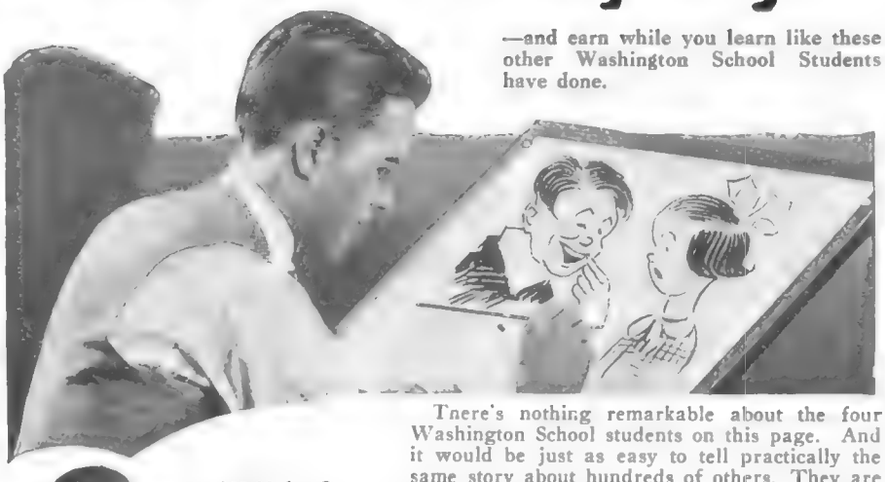

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Walter MacIntosh in an article entitled "Turning Idle Hours into Golden Hours" says:

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"The great mass of people just 'plug along,' earning only enough for the bare necessities of life, but wishing for some of the luxuries and extra comforts.

If those people only realized that profitable use of their spare time would bring some of the very luxuries and comforts that they long for, they would be turning spare time into money.

"Goethe said, 'One always has time enough, if one will apply it well.' Just make it a point to watch some of your friends and your business associates, and note how many of them, claiming to be 'rushed to death,' idle away hours that should be turned to good account. Also, be frank and courageous enough to watch yourself and see how you do the same thing.

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MONEY MAKING

October

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The Open Air Profession, *Uthai Vincent Wilcox*
Starting in the Mail Order Business, *George R. Downs*
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The Junk Man—A By-product of Civilization, *Walter Raleigh*
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Deaf-Phone and 2-Stage Amplifier

By A. P. PECK

(*Continued from page* 519)

of a small hook projecting through a slot in the side of the cabinet and so placed that the reproducing receivers, when not in use, can be hung thereon, which action will open the circuits. The construction of this hook is simple in the extreme, and is clearly shown in Fig. 2. A spiral spring closes the circuit between the metallic hook and a small strip of copper or brass which is placed just above the slot. This piece projects downward slightly beyond the edge of the slot so that it will make good contact with the hook.

A single rheostat controls the filaments of the two tubes, which tubes are of the small dry-cell type, such as the UX-199. This rheostat can be used as a volume control, and by varying the resistance the reproduction of the voice can be regulated to suit the user. Also the incorporation of this rheostat allows the use of a 4½-volt battery, with its consequent longer life than that of a 3-volt battery.

The audio-frequency transformers used in this instrument can be of practically any kind. They need not be of the very best because they will not be called upon to amplify the extremes of sound vibrations that are found in radio music. The two that were used in the particular unit illustrated, are of a very old type but give excellent service for this particular work. Even the very cheapest of transformers could be pressed into service for the instrument with no detrimental effects. The ratio may be from 5 to 1 up to 10 to 1.

An ordinary microphone such as is used in telephones could probably not be used in a lay-out of this nature with any degree of satisfaction. These microphones usually require quite a high voltage, and furthermore, are not particularly sensitive to weak sounds. With the microphone from the portable deaf set, as shown in the photographs, it was possible to *detect a whisper over ten feet away from the unit.* The whisper was inaudible without the aid of the instrument, but could be heard quite plainly with it.

The microphone was the only part of the original deaf set that could be employed. The receiver that was formerly used in connection with it was far too delicate to employ in the last stage of a two-stage audio-frequency amplifier. It became completely paralyzed from the current. Therefore, a pair of standard radio receivers was used with very good results. Undoubtedly, a pair of small ear phones that fit within the ear and that have been described in this magazine heretofore, could be employed with this instrument. They are made in various resistances, and if used, a pair having a total resistance of 2,000 ohms at least, should be selected.

Taken as a whole, the results obtained with this apparatus were far better than with any other deaf-set that the writer has ever tested. Persons afflicted with poor hearing have tested the instrument and pronounced it quite satisfactory.

The only parts that had to be placed outside of the cabinet in the instrument illustrated were the head phones, the "A" battery and the 45-volt "B" battery. If a somewhat larger cabinet were used, the batteries could be placed within it, using a small 3-cell battery for the "A" and two small 22½ blocks for the "B" battery. In this way, the unit would be entirely self-contained, and would be really portable.

Telephoning over a ray of light

Building on the Telephone Principle

FIFTY years ago Alexander Graham Bell discovered the principle of the telephone. His first telephone employed wire as the connecting path over which words passed. Four years later he used a beam of light instead of wire to carry speech between telephone instruments.

Today, both wire and wireless telephony are employed on every hand in the service of the nation. Wire telephony, with its thousands of central offices, its complex switchboards and millions of miles of wire, envelops the country, carrying for the American people 70,000,000 conversations every day. Wireless telephony is broadcasting entertainment and carrying important information to the remotest regions.

But new applications of the telephone principle are still being found. In the loud speaker, in the deaf set, the electrical stethoscope, the improved phonograph, the telephone principle has been adapted by the Bell Telephone Laboratories to the uses of the physician, the public speaker and the musician. The scientific research and engineering skill, which enable America to lead the world in telephone service, are also bringing forth from the telephone principle other devices of great usefulness.

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How to Build Cedar Chests

By WILLIAM M. BUTTERFIELD

(*Continued from page 507*)

cedar chests of the plain box variety. If it is used, all of the holes for the round head copper nails, used to secure the trimming to the chest, must be carefully spaced, lined and drilled, otherwise a very unsatisfactory trim will result. Care must also be taken in driving the brads used in gluing the chest so that they will not interfere with the copper nails.

American mahogany molding can be used to form panel effects, as a finish for the bottom of the chest or division point between lid and chest. The molding can be bent after steaming. It is glued and braded to the cedar as illustrated. A large assortment of composition molding is to be had at the furniture makers supply houses which may be used for decorating a cedar chest. This molding is put on with glue and brads.

Feet, legs, knobs, poles, hinges, locks, brads, screws can be found in various assortments at the supply houses. All of the laborious work in building a cedar chest need therefore be confined only to the construction of the chest—its trim being practically the simple assembling of parts already made.

For a leg frame, such as is illustrated in the top center view, four 2-inch square legs with turned center and bottom parts are used. Such legs are found in stock for chair making. Four front legs used for that purpose will answer. Or an old chair will provide legs by sawing off the back, thus making the four legs of one length.

The top rails for such a frame are ½ inch thick and 2 inches wide, the lower ones ½ inch thick and 1 inch wide. All parts are secured with wide tenons and mortises—the uncut full sizes of each rail forming its tenons.

The object of cedar in a chest is to drive away moths and other vermin with its odor, therefore in finishing a chest, it is desirable to use a finish that will not cover the wood thickly. Paint will not do, some wax finishes are useless and most varnishes are not to be thought of. A very thin coat of shellac answers very well for the inside, while for the outside, shellac somewhat thicker, in three or more coats is about all that can be used successfully. To obtain a high finish the various coats are polished and smoothed; first with pumice, then rotten stone and cedar oil, ending with a leather pad moistened in half cedar and half banana oil.

All metal trim should be fitted, and partially secured with nails or screws, before finishing either the inside or outside of the chest. The trim should then be removed and only replaced when the chest is completely finished. Mahogany or other wooden or composition trim is finished with the same materials and at the same time as the chest.

TROPICS FIFTY MILES UP

Discussion of the observation of meteors, made during a lifetime by W. F. Denning, the English amateur astronomer, has revealed a totally new aspect of the upper air.

"It has been known for some time," says Professor H. H. Turner of London, "that the temperature, which falls rapidly as we ascend for the first few miles, ceases to fall about eight miles up. This is beyond the reach of airplanes and balloonists, but not beyond that of exploring toy balloons. Even their information, however, has a limit short of twenty miles.

Meteors have now extended our knowledge up to fifty miles and have shown that the atmosphere becomes actually hotter in a certain region of these upper strata; the climate becomes tropical as regards temperature.

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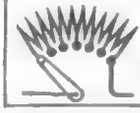

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AMAZING STORIES

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Contents for October

BEYOND THE POLE, by A. Hyatt Verrill. Tells you about a wonderful people near the South Pole, of the captivity of a sailor and his travels through their terrible, yet wonderful country.

THE DIAMOND LENS, by Fitz-James O'Brien. One of the world's classics. Written years ago, but which retains its flavor. Brings in an exquisite microscopic being, the enchanting heroine of the story.

THE PURCHASE OF THE NORTH POLE, by Jules Verne. The concluding installment of this entrancing story. The author's ingenuity in evolving a cause for the fault in mathematics revealed in the last lines.

A COLUMBUS OF SPACE, by Garrett P. Servis. The story draws to an end. Attack, adventure, captivity are all successfully coped with. And then comes a tragic termination.

THE ISLAND OF DR. MOREAU, by H. G. Wells. One of the most astounding stories ever written by the well known author. Hold our interest at a feverish pitch of excitement; we will not give away the contents to spoil it all for you.

BLASPHEMERS' PLATEAU, by Alexander Snyder, wherein some eminent scientists successfully experiment with infinite secrets, until they become drunk with their power. Then another scientist arrives on a friendly visit. It is a powerful and gripping story which is sure to hold your interest.

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Modeling by Photography

By LUCIEN FOURNIER

(*Continued from page* 488)

ies of photographs from the profile, each more and more diminished, as may be seen in the extremely curious third photograph.

Here is how the result is obtained. We have said that the patient who is having his portrait made is seated upon a bench mounted on rollers moving on two rails. As fast as the motion picture camera takes a view of the profile the bench moves back 1/10th of a millimeter from the lens, but as it moves back the shadow of the iron strip reduces the depth of the profile by 1/10th of a millimeter, so that the photograph taken after the first will be less complete, the third will give a profile still more reduced and the last will show nothing more than a tiny bit of the ear and a fragment of the collar. It is generally necessary to take about 80 successive profiles of the same subject.

Let us say at first that the motion picture camera perforates each negative at each of its angles at the moment of exposure. These negatives may then be easily separated. The individual frames are developed and printed. They are next placed one after the other in a pantograph apparatus which is represented in Fig. 5. It is seen that the negative is illuminated by a beam of light which projects the image on a sheet of ground glass. The stylus of the pantograph is held in the hand and the cutter, which is at the other extremity of the levers of the apparatus, cuts the exact profile of any desired dimensions from a sheet of zinc 1/10th of a millimeter thick.

We now have 80 zinc profiles. Let us assemble them, one upon the other in the order followed in taking the pictures. We now find that we have a profile in relief which is precisely that of the person seated before the lens.

With the assembled profiles a mold is made which permits reproductions of the profile in any medium desired. The sharp edges are rounded off, and we have a perfect reproduction of the portion of the original subject seen through the lens of the camera.

This method may also be used to produce sculpture in the round by photographing the opposite side of the head also, joining the two resulting reliefs at the center.

We do not anticipate that this method of "photosculpture" will supersede to any great extent the methods now used, but it seems probable that the simplicity of the procedure and the comparative lack of skill required, will make it applicable in many fields at present limited by the supply of artistic talent. If the system is developed on a commercial scale it will probably take the same position relative to true sculpture that photography does to painting.

DECLARES JOHN FITCH INVENTED STEAMBOAT

Suggesting the construction of a new fireproof Patent Office building in Washington, Representative Sol Bloom said recently that if there had been "adequate facilities" to preserve patent records in the early days of the nation John Fitch and not Robert Fulton would have been recognized as the inventor of the steamboat.

"Until recently," Mr. Bloom said, "it was believed that Robert Fulton was the one who first applied steam to the art of navigation. However, in examining the records of the United States Patent Office and other departments of the Federal and State Governments, it has been proven conclusively that John Fitch built and successfully operated a steamboat of his own conception as early as 1785."

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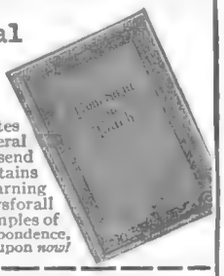

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The Truth About Astrology

By JOSEPH H. KRAUS

(*Continued from page* 496)

"THE NATION'S COUNSELOR."
PROF GUSTAVE MEYER
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1140 *Bloomfield St.,*
Corner Twelfth Street,
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Hoboken, N. J., August, 2, 1926.

My dear Miss Kraus:

According to the data of your birth, I find that you were born with the Zodiacal Signs of Aries, and Pisces rising, and as the ruling Planet of Aries is the fiery, evil and martial Planet Mars, and of Pisces, the fiery, and fortunate Planet Jupiter, hence, Mars, and Jupiter, will be your ruling Planet through life, and while you would experience quite a turbulent and hard up hill struggle, and more clouds than sunshine, during your younger years (*died—no operation*) and many narrow escapes from death by accident, illness or operation, and serious trouble and will usually have to fight for your rights, or work quite hard for whatever you legitimately earn yourself, and that your shoulders would usually have to bear the responsibilities of others and you would be a martyr to duty, and the home, and will seldom if ever receive as much thanks for your kindness to others, (*who does*) as you really deserve, you will however, gradually rise in life far above your station at birth, and will acquire a fair amount of wealth, and enjoy success, and hard earned prosperity, slow but sure, and will always be sufficiently fortunate enough to come out of any difficulties in safety which others would not, hence, you should never despair, as you will always have a sprinkle of sunshine in the trail of every cloud, however, if you will only make your slogan "I can and I will" and overcome your too dictatorial, independent, and sarcastic nature, you will then overcome many obstacles towards success and happiness through life.

As you had the Sun posted in the sorrowful Sign of Capricorn, this shows that all of your undertakings through life will usually begin in doubt or darkness, (*so does everyones*—Ed.) however, I find that they will end with more light or hope than what you expect, yet, you will always be subject to melancholy spells when alone too long, hence, you should always keep active mentally, and physically, and avoid sad people, pictures, and stories, however, I find that you will usually be quite fond of such, and that you will usually be happy when you are sad.

You were born to lead, and not to be led, hence, you make a good manager, superintendent, demonstrator or designer, and will always love to dictate, lead and command.

You were also born to lead an eventful, checkered, and romantic life, and will see much of the world, and will profit through your own experience, as well as through that of others, however, your own experience will alternately (*ultimately?—Ed*) cost you dear, unless great care is exercised on your part, hence, you should always guard your morals, health, and temper, and guard yourself in speech, and actions, otherwise you will have much to regret.

I find that your mind will always be quite cool, calm, and collected in an emergency, yet, when such is over, you then collapse.

You will always be very peaceful, and slow to anger, and quick to see the point of an argument, however, if your temper is once aroused, you can then become very furious, sarcastic, bold, daring, unfeeling, dictatorial, and almost murderious, spiteful, and vindictive for the moment, yet, you are not revengeful, as you make a good friend, but a forgiving, and generous enemy.

You will always possess much tact, diplomacy, executive, and oratorical ability, and personal magnetism, or a strong personality, modesty, dignity, and timidity, and you will cultivate friends thereby, yet, you will always prefer a few friends to many acquaintances, hence, people will call you a poor mixer.

I find that people must first know you very well to really like you, otherwise, they will call you too independent, aristrocratic, uppish, cold, or unfeeling, haughty, when in fact you are very sensitive, and good hearted, but not sufficiently demonstrative or enthusiastic in expressing your sentiment in words as you really prefer to do so in actions.

I find that you will always be given to building "Aircastles" so to speak, and that you will always love the country, mountains, quiet, and restful places, and will always be quite healthy, and fortunate living, in or near such places, and near large bodies of water.

You should always guard against much trouble to your head, eyes, and teeth, and feet.

You will always be very sly, shy, modest, reserved, shrewd, secretive, selfish, cautious, capricious, frivolous, skeptical, suspicious, and mistrustful, and will seldom if ever believe what you hear, only what you see, however, if you are once

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convinced of that which you were previously suspicious or skeptical of, you then become one of the strongest advocates of that very thing, or subject in question.

While you can be easily led through your too trusting, over affectionate, ideal, good hearted, sensitive, sentimental, lonesome, and quite effeminate disposition," (*see paragraph* 3—Ed) as you are also very obstinate, head strong, firm, determined, and persistent (*see paragraph above*—Ed) I find that if you once make up your mind to do or say anything, that nothing can then cause you to ever do otherwise than that which you once determined to say or do, hence, you will owe much of your success through life to your indomitable will power, perseverance, and tenaciousness.

I find that you had much sorrow, trouble, and disappointments in your love affairs, and that you had some very serious love affairs, and opportunities for marriage around your 19th, 21st, 23rd 25th years, (*she died in her 20th year*—Ed) however you can thank your lucky stars that you have never as yet married, as you would have been separated or divorced, and I should advise you to if possible, to remain single, unless you have a good day and hour selected for your marriage as such would then modify much of the trouble otherwise indicated to occur in married life.

I find that you will have another very serious love affair, and good opportunity for marriage during the Autumn of this year, or the Winter of 1927 (*in the spirit world*?—Ed)

Your lucky months will always be from December 23rd to January 18th (*died January 9—half way between*—Ed) February 19th to March 19th. April 19th to May 21st, August 24th to September 22nd, and October 23rd to November 21st, and you should always choose these periods for any of your most important undertakings, and anyone born in these periods would be your best friends, and affinity, or the most harmonious for you in love affairs, and marriage,

On looking up your *prospects for this year of* 1926, (*well, well*—Ed) I find that there is quite a mixture of good and evil in store for you, however during the Summer, and Autumn months, you will profit through brilliant schemes, and will benefit greatly through the opposite sex, and the public, and in love affairs, and will be more popular, and sociable than usual, and will overcome adversaries, and will receive much honor, credit, benefit, preferment, and success, if not advancement in position, and will benefit through pleasures, and much benefit is indicated through or to your relatives, and through friends, especially powerful, influential, literary, and scientific friends, and you will realize your hopes and wishes through such friends in particular.

During the Summer months, you should then guard against financial and business troubles, extravagance, heavy financial reverses, and losses by fire, robbery, or systematic robbery, if not trouble and loss through property matters, also legal matters, however, you will make some very radical changes, and journeys, which will be for the best. (*Anything else?*—Ed)

During the late Summer, and also during the Autumn months, much trouble, or loss is indicated through or to any brothers, or sisters you may have, also through neighbors, letters, or writings, and traveling by railway, or auto, and in domestic affairs.

You should look well to whatever you sign or write, and be careful in making changes, and journeys, and guard against fire in the home. (*And we paid* $5.00 *for this!*—Ed)

During the Autumn months, you will have a very serious love affair, and good opportunity for marriage, if not become engaged or be married.

1927.

Throughout this year, you will enjoy much better health, and more peace of mind than usual, also heavy financial benefits, much liberty, pleasure, success, and prosperity.

You will also benefit through friends, and the opposite sex, and in domestic affairs, and you will realize your hopes and wishes, and profit through brilliant schemes, and be more popular, and sociable than usual.

During the Winter months, if you are still single, you will have a very serious love affair, and good opportunity for marriage, if not be married. Your morals will be elevated, and you will benefit through something connected with either the Church, publishing, or advertisings, science, creditors, and traveling by water, however, much trouble, or loss is indicated through or to relatives, and through something connected with either the grave, property matters, or through people engaged in such. You should avoid underground places, and traveling in such, and going in or near public buildings in the course of erection.

During the Spring months, you will enjoy very heavy financial benefits, much liberty, and prosperity, and much benefit is indicated through or to relatives, also through neighbors, letters, or writings, and traveling by railway, auto, and in domestic affairs.

During the Summer months, your pleasures will be greatly handicapped, and you should avoid speculative ventures, and hazardous games of chance.

During the late Summer, and early Autumn, you should take a good blood and nerve tonic, and guard against serious illness, accident, or operation, and also stomach, bronchial, and kidney trouble, nervous complaints, and fire, burns, cuts, scalds, or bruises, (*he omitted two or three things*—Ed) and much trouble or loss is then indicated through or to relatives on your father's side also through servants, or inferiors, if not through small animals.

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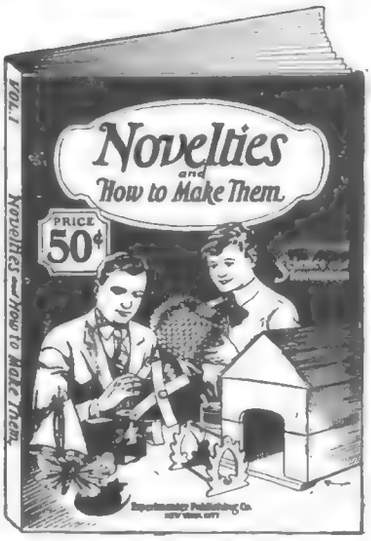

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During the early Autumn months, guard against public enemies, quarrels, legal trouble, reverses and trouble or loss through the public, and the opposite sex.

During the late Autumn, you will be in danger of bereavement, and should guard against losses by fire, robbery, or systematic robbery, also guard well any plans, or secrets, you may possess or such will become exposed to others, who will profit through same. Also avoid religious arguments, and guard your morals, health and temper, and much trouble, or loss is indicated through something connected with either the Church, publishing or advertising, science, creditors, and traveling by water, yet, you will receive much honor, credit, benefit and success if not advancement in position.

Your truly,
(Signed) *Prof. G. Meyer*
GM/MR Scientific Astrologer;

Thus, at one and the same time we find that the young lady is a martyr to duty and her home, and is good-hearted and yet she is cold, unfeeling, selfish and frivolous. She will have narrow escapes from death, illness and operation. Escapes?—She should guard against serious illness and kindred complaints, and fire, burns, bruises and animals, including relatives on her father's side, servants and other inferiors, (*pardon the wit*—Ed) and yet she will always be healthy.

Please note the facts that the subject died January 9th, 1919.

Her lucky months are from December 23rd to January 18th, and again we reiterate she died on January 9th.

She should always choose these periods for her most important undertakings. Well, is not death an important undertaking? Perhaps the astrologer was right. Please remember that we are quoting directly from the horoscope. There are others that we could quote from but this one is infinitely more subtle. The claims are not as brazen as those of some other astrologers.

Again looking through the manuscript we also find that the subject will be cool, calm and collected in an emergency; and is peaceful, slow to anger and a forgiving and a generous enemy, which statement is directly contradicted by the statements that she is furious, sarcastic, bold, daring, unfeeling, dictatorial, spiteful and vindictive.

We note she will lead a checkered and romantic life and will travel, yet she loves the country, mountains and quiet restful places and is very shy.

Further she is cold, unfeeling and at the same time good-hearted, sensitive, and sentimental.

She is haughty yet lonesome.

The manuscript tells us that she is shy, modest and reserved and also that she was born to lead, command, had executive and oratorical ability and personal magnetism.

These factors must befit one individual or another. An individual cannot be born to lead and at the same time be easily lead because she is too trusting. She must do one or the other. She cannot be sly and too trusting; she cannot possess personal magnetism and yet be lonesome; she cannot be unfeeling and yet sensitive.

Is there anyone in this country who can show us how a young lady can be tactful and possess diplomacy and yet be uppish, haughty and sarcastic? Can anyone show us how a cautious, skeptical, suspicious and mistrustful girl can be easily lead because she is too trusting and over-affectionate? Or perhaps someone will come forward and show us how a capricious, frivolous girl must fight for her rights, work hard, be persistent and show perseverence and tenaciousness? Then we have that case of the timid individual being a born leader, dictatorial and commanding.

Human beings are vain. They like to be told things which please them and naturally when an astrologer tells you things which are 50% true you think he is wonderful. The human being doesn't stop to reflect or consider that that astrologer has made just as many statements which are 100% incorrect.

We did not fake the statements in above paragraphs. They are found in the horoscope. You can find them by jotting down the adjectives as you go along and then match one against the other. You will find that there are many more contradictions than those which we have given you.

The statement still rests that there is nothing in astrology; that it is buncomb, pure and simple; that only one-half of the statements and probably not even that many will fit any individual case, and not only will they fit that case in particular but all cases in general. Why do not these astrologers warn of a possible death? Why did the astrologers not tell us of the next step in the eventful life of 20-year-old Richard Reese Whittemore? We should like to change the definition of astrology to read: Astrology—a pseudo-science entirely discredited. It is pure bombast, nonsense, but was the livelihood of quite a few who catered to the credulous-minded, to those who would like to get a glimpse into the future by unscientific and unethical systems.

(*More anon*)

Model Department

(*Continued from page* 509)

Rules for Model Contest

1. A handsome trophy cup engraved with your name, will be awarded as the prize for the best model submitted during the month. The decision of the judges will be final and will be based upon, A—novelty of construction; B—workmanship; C—operating efficiency of the model as related to the efficiency of the device which the model simulates, and D—the care exercised in design and in submitting to us sketches and other details covering the model.

2. Models of all kinds may be entered. They may be working models or not, according to the subject that is being handled.

3. Models may be made of any available material, preferably something that is cheap and easily obtainable. Models made of matches should not be submitted to this department but should go to our Matchcraft Contest Editor.

4. Models must be submitted in all cases. Good photographs are also highly desirable and where the maker does not desire the model to be taken apart, legible drawings with all dimensions covering parts that are not accessible must be submitted.

5. Models should be securely crated and protected against damage in shipment and sent to us by parcel post, express or freight, prepaid. Models will be returned when requested.

6. Models for entry in any particular contest must reach this office on or before the 25th of the third month preceding date of publication. For instance, models for the November contest must reach us on or before the 25th of August.

7. Address all entries to Editor Model Department, c/o Science and Invention Magazine, 53 Park Place, New York City.

ODD AND UNUSUAL PATENTS

Part II.

Will appear in November number. Lack of space in this issue prevented its appearance this month.

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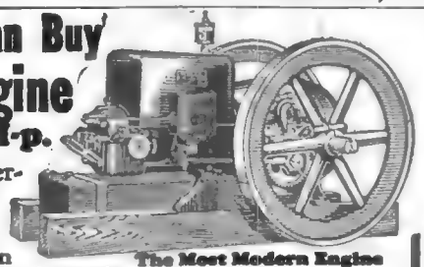

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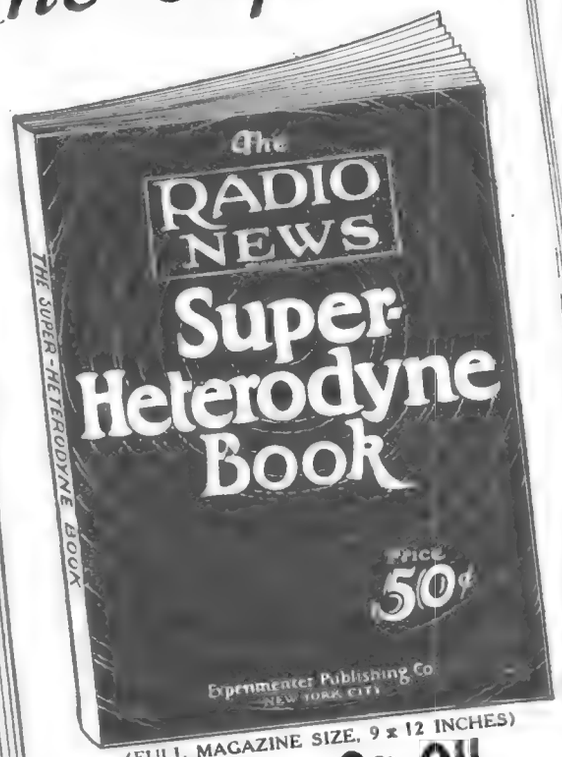

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Important Things Inventors Should Know

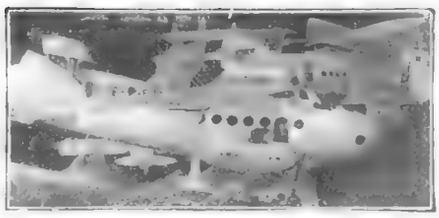
By LEO T. PARKER

GENERALLY speaking, all inventors are interested in making money. It is true that many persons have earned large sums of money through patents without understanding much about the basic laws that relate to them, but there are various simple rules of arriving at a reasonably accurate conclusion whether a new invention is destined to be profitable from a financial standpoint. The amount of profit derived from the sale of each article is important. The period of time over which the popularity of an invention is likely to continue is also worthy of consideration. For instance, many articles are salable only so long as a particular style or "craze" is in vogue, or until an early change of conditions makes its further use undesirable. Another very important thing that is often overlooked is whether the invention is salable throughout the year. Some articles can be sold only during the winter and others must wait for a summer season. A seasonable invention may not be desirable, particularly because a company organized solely for that business must necessarily survive a considerable portion of each year without incoming revenue. In order that seasonable inventions prove profitable sources of incomes, quite obviously, they must be unusual selling features during the short period they are salable. However, sometimes firms that specialize in general products can be induced to market a seasonable invention, and this class of concerns very often are the only ones which can satisfactorily promote the sale of such articles.

The general structure of an invention, also, must be considered. That is, whether of a complicated or simple nature. It is true many of the most complicated pieces of mechanism, such as the air brake, the lineotype machine, printing press, and others, have proven unusually profitable for the inventors. On the other hand, some of the most simple ideas have made millionaires of the originators almost overnight. In fact, many simple and useful articles enjoyed a steady public demand all of the year round during the complete 17 years' life of the patent, and they, of course, are profitable inventions.

The universal adoption of an invention, irrespective of its simplicity or small selling price will result in a princely income to the patentee. There is at least one important advantage of patenting a simple invention and that is, even if the inventor is not successful in obtaining an outright purchaser of the patent, he can market it himself with a small investment and if the invention is accepted at all favorably by the public a comfortable income can be independently realized. But if the device is complicated and no firm can be interested to purchase the patent or manufacture it on a royalty basis, the inventor who has limited finances, always has difficulty to realize income from his labors of designing the device.

The possibilities of voluminous sales of a patented article should not be overlooked. For example, an individual once invented a very desirable article for use in penitentiaries, but inasmuch as the device sold at a low price and only one was needed in each penitentiary, even though he actually was successful in selling the invention to more than one-half of the prospects in the United States, he realized only a small amount of money from the patent. The invention practically was a failure so far as the profits derived from it are concerned. If this inventor had carefully considered his invention from all angles he would have saved himself trouble and labor which may have been utilized in perfecting and market-



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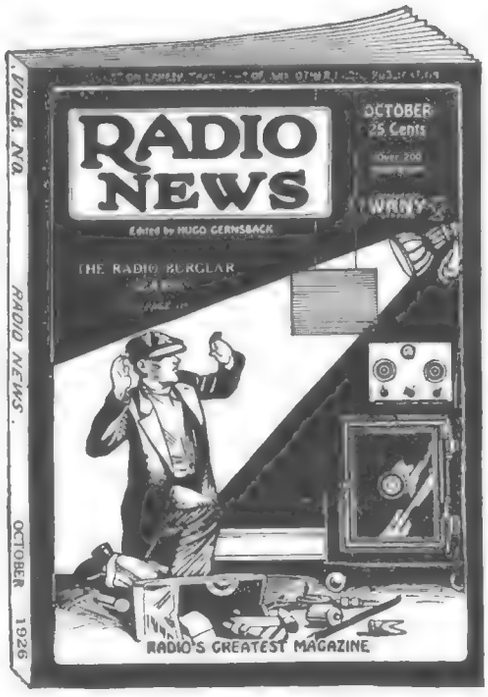

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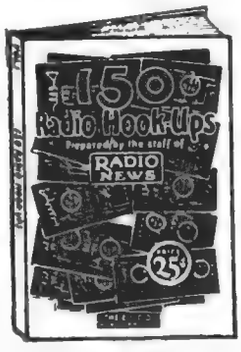

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ing an invention having far better prospects of a large volume of sales.

Many of the most successful inventors are keen observers who take advantage of all opportunities. Some of them work solely to improve newly discovered arts before a multitude of other inventors are endeavoring to accomplish the same thing. On the other hand other successful inventors simply have confidence in their own ideas and do not hesitate to spend the required money to promote them irrespective of the kinds of inventions already patented. The inventor who selects a comparatively new field in which to make improvements, no doubt, is more likely to patent valuable things than the individual who tries to invent something new in machinery or other apparatus that is practically perfected, although of course there is room for improvements in all lines. An average individual may find it necessary to spend many months in diligent study before he thoroughly understands the mechanism of a locomotive, and yet he may conceive a very valuable improvement at first glance. Every now and then our attention is attracted to an inventor who almost instantaneously gained wealth and fame through a simple improvement of a complicated piece of mechanism with which he is less familiar than many other persons. Unquestionably it is the idea that counts.

Moreover numerous inventors have been made rich by accident, so to speak. Not long ago a United States patent was issued on an anti-theft device for aeroplanes. Such an invention is practically useless and worthless today, but if perchance someone perfects a safety device by which aeroplanes are made a popular means of transportation this inventor holds a basic patent from which he may receive millions of dollars in royalties.

Actual cases are numerous where seemingly unprofitable and useless inventions are made popular and come into great demand through an unlooked for change in circumstances. But sometimes the apparently accidental popularity of an invention is foreseen by an unusually observant inventor who believes the change will take place.

About fifteen years ago a certain foreigner who resides in New York obtained a basic patent on a popular improvement on automobiles. At the date the patent was issued the invention was advanced far beyond the existing needs and conditions, but after a few years the automobile industry grew up to the invention, so to speak, and a certain automobile manufacturer was very anxious to secure the patent rights of the once apparently worthless invention, but its inventor could not be located. A thorough search was instituted by leading detective agencies in this country and abroad, but without avail. The inventor has never been found although he is thought to be alive. As time passes the term of the patent grows shorter until now it has but a short period to run before its expiration. The present rights to this patent are worth many thousands of dollars and the amount of cash which the inventor might have received for it a few years ago is beyond accurate estimate. This inventor probably became discouraged and concluded that his invention was worthless and has forgotten about it.

Very often a new thought is an accidental occurrence. Howe, the inventor of the sewing machine, which netted more than two million dollars in royalties, worked from an idea which he received while sitting idly watching his wife make a child's dress. He was a laborer and testified in later court proceedings that he mentally compared the slow movements of his wife's fingers when making stitches, with the rapid reciprocal movements of a hammer machine which he had seen in operation. With the idea once in mind he determined to make a sewing machine for his wife's own individual use, not thinking at that early time that it might

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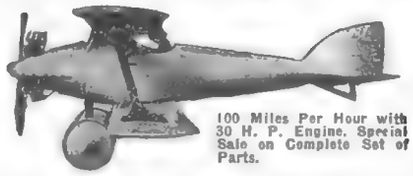

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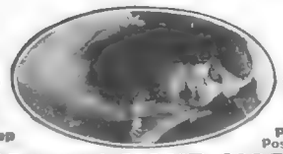

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prove a profitable machine to manufacture and sell. But it was not long before keen business minds offered financial aid to the inventor of such a labor-saving piece of mechanism.

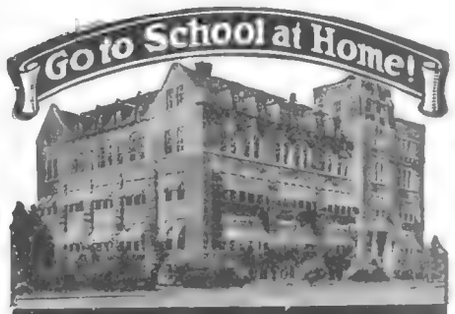
The facts prove that the first model of an entirely new invention seldom operates with such success, but to obtain a valid patent the patent laws merely require that the device is operatable. For this reason, inventors should not become discouraged because their working models operate crudely. Basic patents may be obtained on crude models and the patentee may exact royalties from manufacturers of later improvements.

Very often individuals spend considerable time and money in perfecting an invention on which they expect to obtain a strong patent, and later learn that someone else already holds the basic patent.

Wise and experienced inventors never proceed blindly to spend money experimenting and making models and then file an application for a patent, without first searching the Patent Office records. Considerable time, money and disappointment will be saved inventors who adopt this method. It is far better to learn at once that a device is old and unpatentable than it is to waste valuable time and much money with high expectations which are later shattered. On the other hand a "search" is discouraging to a person who has invented a very valuable improvement and who may decide not to proceed to patent the invention, because certain apparently similar patents are found. Sometimes improvements on old and well-known devices are more valuable than the original and basic patents. This is true particularly because of the fact that considerable expense and difficulty may be experienced in introducing and establishing the usage of an entirely new thing, whereas an improvement of an already popular product is at once recognized as being valuable and the users of the old device may be readily influenced to purchase the improved invention. A great volume of sales can then be quickly effected without much expense. For these reasons all inventors should very carefully examine the patents found in searches of the Patent Office records before deciding not to patent the invention. Furthermore, it should be remembered that a valid and strong patent can be obtained on a combination of old and well-known elements, provided, of course, new and useful results are accomplished by the unitary functions of the structure comprising the old elements.

TELEPHONE IMPOSSIBLE!

Here is an interesting clipping from a Boston newspaper published 61 years ago: "A man about 46 years of age, giving the name of Joshua Coppersmith, has been arrested in New York for attempting to extort funds from ignorant and superstitious people by exhibiting a device which he says will convey the human voice any distance over metallic wires so that it will be heard by the listener at the other end. He calls the instrument a 'telephone' which is obviously intended to imitate the word 'telegraph' and win the confidence of those who know of the success of the latter instrument without understanding the principles on which it is based. Well-informed people know that it is impossible to transmit the human voice over wires as may be done with dots and dashes and signals of the Morse Code, and that, were it possible to do so, the thing would be of no practical value. The authorities who apprehended this criminal are to be congratulated, and it is to be hoped that his punishment will be prompt and fitting, that it may serve as an example to other conscienceless schemers who enrich themselves at the expense of their fellow creatures."—*Contributed by Lewis Braden.*



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Book Review

THE MAN NOBODY KNOWS, by Bruce Barton. Stiff cloth covers 5¾" x 8¼", 220 pages. Published by The Bobbs-Merrill Co., Indianapolis, Ind. $2.50.

This extremely popularly written book will doubtedless live for many years and be found on the library or study table of many homes. Mr. Barton, who is a well-known writer of the present day, has here undertaken to show us in popular language what a wonderful business man and executive Jesus was. This book brings the old aspects of the subject up to date and mixes them with present day problems and human situations. It required a very careful study of the Bible and myriads of events in the life of Jesus to be able to write a book as well as this is written. It is interesting above all perhaps to know why the book was written, and the author in an opening preface tells "How it came to be written."

ELECTRICAL AMUSEMENTS AND EXPERIMENTS, by Charles R. Gibson, F.R.S.E. Stiff cloth covers, 5" x 7¾", illustrated, 214 pages. Published by J. B. Lippincott Co., Philadelphia, Pa.

A quantity of well-known electrical experiments somewhat modified in their descriptions and with new illustrations are given in the pages of this quite interesting work. The idea is to make young people do their own experimenting. The boy, or let us even say a girl, who constructs an operative microphone or telephone certainly deserves far more credit than one whose amusement comes from perhaps a $150 model railroad. The whole idea of the book is to have young people do things for themselves. It is a sort of axiom with "those who know" that we learn more from our failures and mistakes than from any other source, and there are enough descriptions of home-made apparatus contained in this book to teach the young student how to overcome difficulties and how to do experiments in various branches of electricity with apparatus which he has made himself.

MICROBE HUNTERS. By Paul de Kruif. 358 pages. Illustrated. 6x8½ inches. Board cover. Harcourt, Brace & Co., 383 Madison Ave., N. Y. C. Price, $3.50.

There is a great fascination for the layman, as well as the scientist, in the subvisible world—the world that can be shown to us only by the use of a microscope. People as a whole realize that there are thousands of different kinds of "bugs" which in many ways affect our daily life and health, but there is an appalling lack of knowledge about them. We speak more or less glibly about vaccines, antitoxins, the isolation of various germs, etc., but when the bottom of the matter is reached, there are many who are unable to tell the difference between the terms employed above.

Even though people are familar with these various terms, the chances are that the names of the pioneers of the searchers of the world that is bounded by the limits of a drop of water, are just names and little more. Pasteur is a name that is familiar to nearly all, but who has heard the name of Leewenhoek mentioned at the same time? Yet this man was every bit as great as the energetic Frenchman, because he was really the Christopher Columbus of the microscopic world. This Dutchman, who had no scientific training whatsoever, discovered that drops of water have inhabitants by means of microscopes of his own construction.

About twenty years after Leewenhoek died there was born an Italian named Spallanzani, who started growing his own microbes in jars and studying them. Years later Pasteur found that microbes could be put to use in preventing disease by the use of vaccines; then came Koch, a German country doctor, who had only a microscope and had to improvise all his other apparatus, but as he grew older was considered the foremost microbe hunter in Germany, and identified a mosquito as the disseminator of malaria.

Other microbe hunters that are mentioned in Dr. de Kruif's book are Roux and Behring; Metchnikoff, the madcap Russian; Theobald Smith, the American who found out that ticks spread Texas fever among cattle; Bruce, Ross and Grassi, who found that malaria was spread by a certain mosquito; Walter Reed, the valiant American Army doctor, who found the remedy for yellow fever; and Paul Ehrlich, the German, who gave to the remedy he discovered for the world's most horrible disease, a number.

These men and their work Dr. de Kruif has told of in a manner that is only too seldom found in works of this nature. He presents his characters so that you feel their pleasures when they triumph and their sadness when their experiments turn out unsuccessful—in short he gives the human side of the investigators. If more books on kindred subjects could be written in this style, there is little doubt that there would be a great deal more interest shown among laymen in scientific matters. It is a book which we heartily recommend to everyone whether they be scientifically inclined or not, for it will give them some idea of what pioneer microbe investigators have accomplished.

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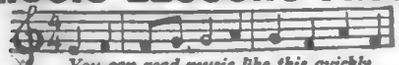

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Our "Spiritualistic Investigations"

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(*Continued from page* 536)

We were warned to move neither hands nor feet during the manifestation, as the medium took pains to explain that instances have been known where inattention and disobedience in matters spiritual, have been fatal to the medium.

After sitting in this position, which was far from comfortable, for a few moments . . . audible taps were heard coming from the table.

Slowly . . . distinctly came the knocks . . . one . . . two . . . three . . .

Then a few moments of silent waiting . . .

The room was as silent as the tomb of a Pharoah.

Soon the table seemed to rise from the floor . . . slowly . . . slowly . . .

At last it was raised at least a foot from the floor. The eyes of the medium seemed glued upon us. The table hesitated, as it were, the spirits seemed to feel the presence of an unbeliever, so stated the medium.

In a droning voice, Madame Denton asked us to concentrate our minds upon things foremost in importance to ourselves, and to dear ones about us. We did so. Several distinct knocks were heard, supposedly in reply to our thoughts. The table had, by this time, returned to its original position on the floor. So slowly had this descension been made, that we scarcely noticed it. Several more taps were heard, and then Madame Denton asked us if we had been satisfied with her seance, and whether there were any further questions to be asked. Simultaneously we informed her there were no more questions to be answered.

We paid our fee, accepted the medium's invitation to a future call and departed.

It seems that both my friend and I had fully discovered the "modus operandi" employed by this faker. The illustration I believe my readers will find clearly descriptive. A pole, the top of which had been camouflaged to correspond with the rug, was operated from beneath. The table was placed in a manner such as to tip slightly, in answer to the questions put to it. Raps were likewise produced by this pole striking the lower surface of the table top.

The levitation of the table was accomplished by the pole being pushed up from below, so as to lift the table from the floor entirely. Our hands bearing down upon the table top, and seated opposite to one another, as we were, we, ourselves, quite well balanced the table, as would other subjects in our place do the same, and help deceive themselves.

Into the night, and the teeming rain, we went. My friend, knowing the method, by which this so called phenomena was accomplished, as he afterward explained, trusted that the medium might have mystified me, so as to furnish him an opportunity of describing one that I had over-looked. The truth of the matter was that much time and experimenting was devoted by the medium and her aides, in perfecting so unusual a method of accomplishing this so-called spook table arrangement, which has no doubt mystified numerous believers.

Spirits may come, and spirits may go, so say the mediums and prohibition officers, but table raps will go on forever. It is merely a matter of improving one's method, over that of the others, that spells fortune to and makes the most successful medium.

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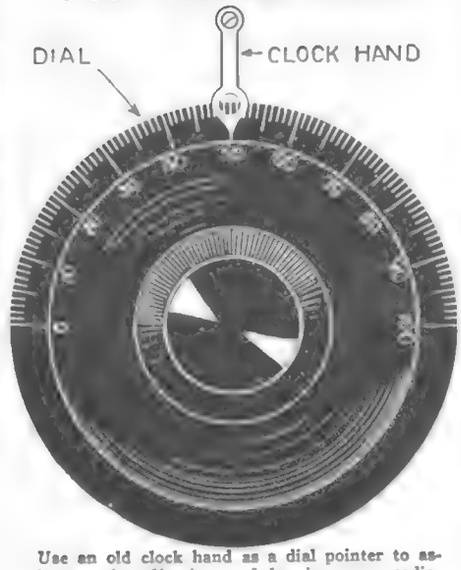

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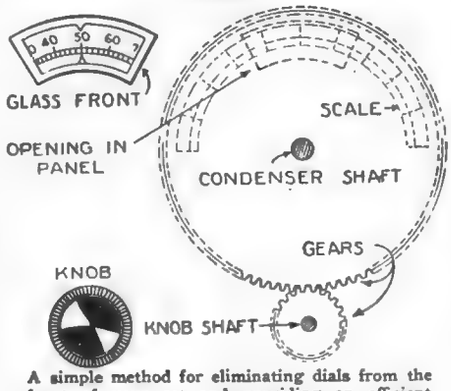

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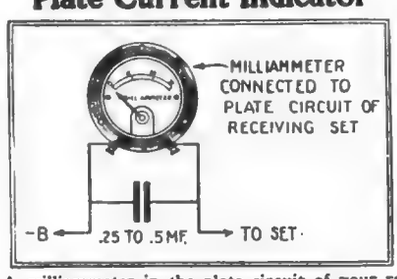

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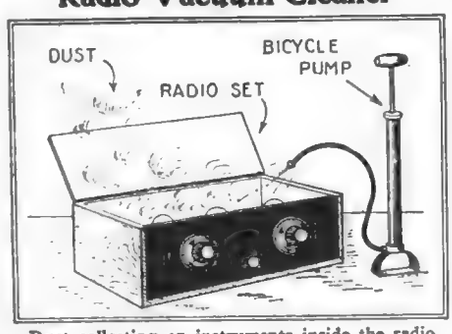

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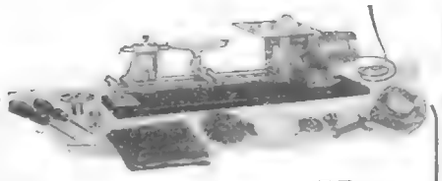

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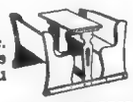

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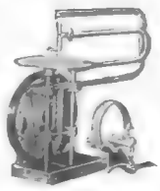

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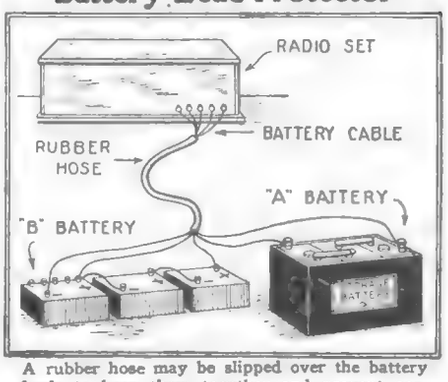
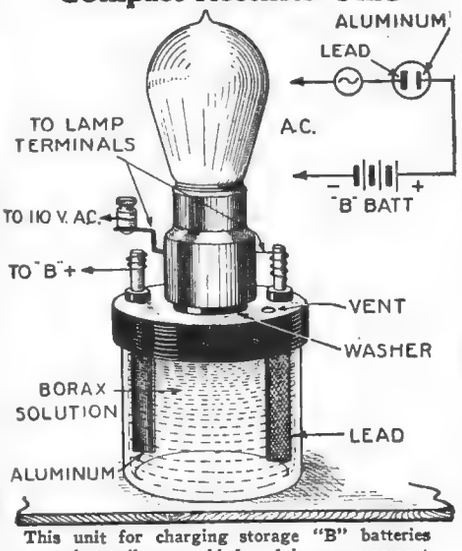
Battery Lead Protector



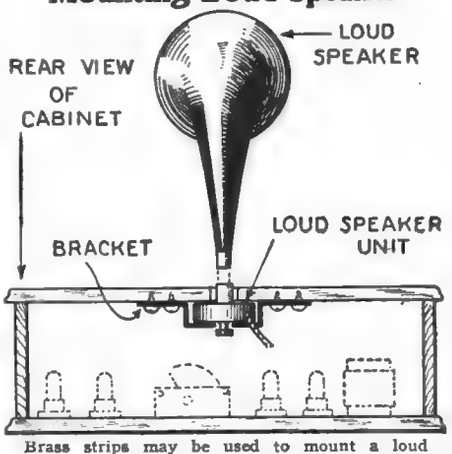
A rubber hose may be slipped over the battery leads to keep them together and prevent corrosion from acid fumes.

Compact Rectifier Unit



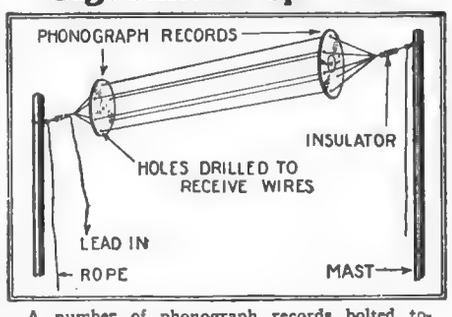
This unit for charging storage "B" batteries may be easily assembled and is very compact. —B. G. Switzer.

Mounting Loud Speaker



Brass strips may be used to mount a loud speaker unit on the top of your radio set. This will eliminate long leads.—B. G. Switzer.

Cage Antenna Spreaders



A number of phonograph records bolted together for strength may be used for cage antenna spreaders if drilled as shown to receive wires.—Fred Ebel.

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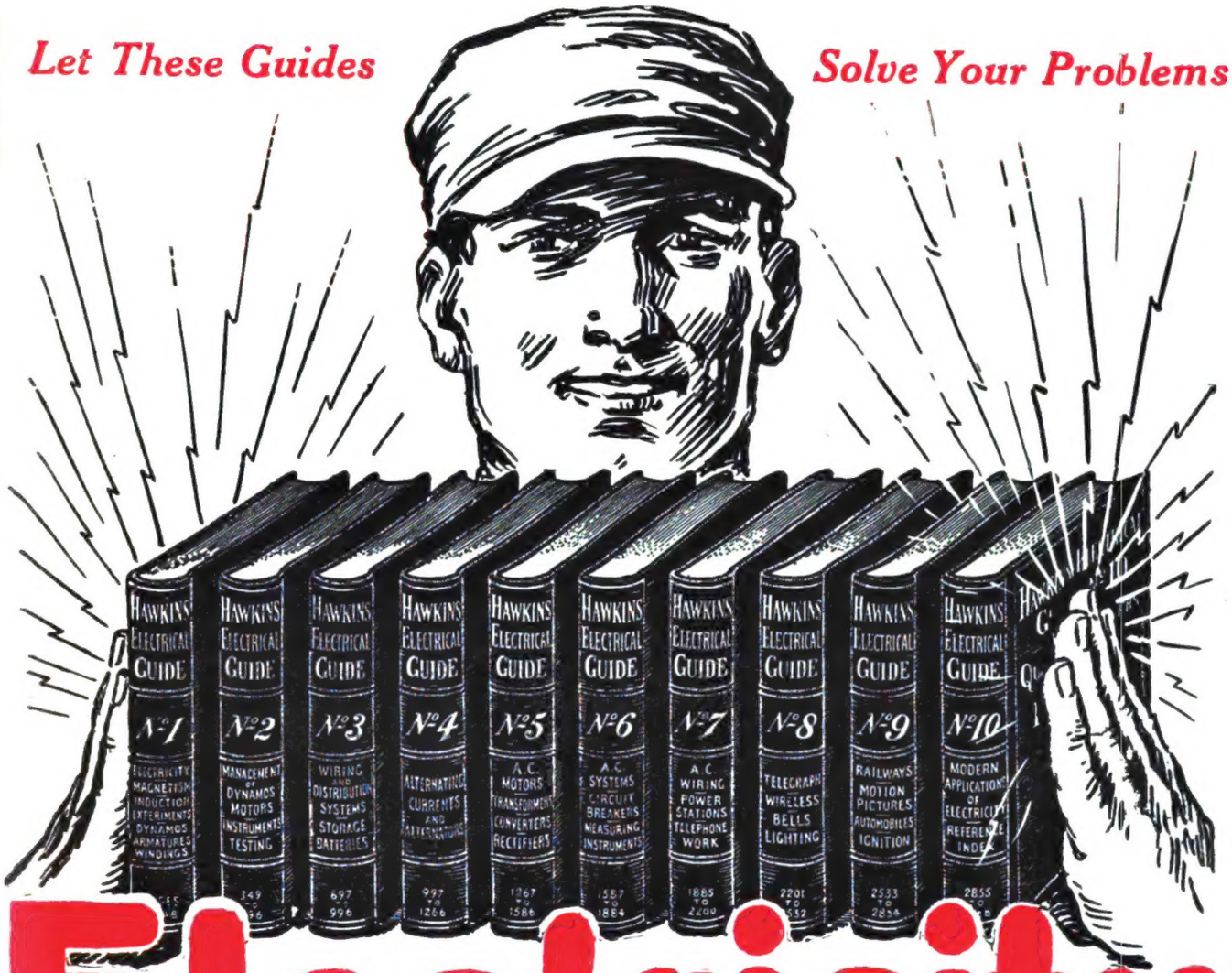

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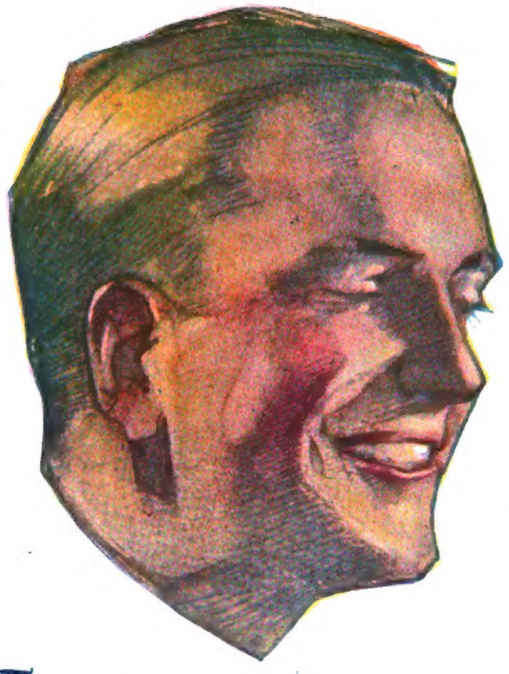

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